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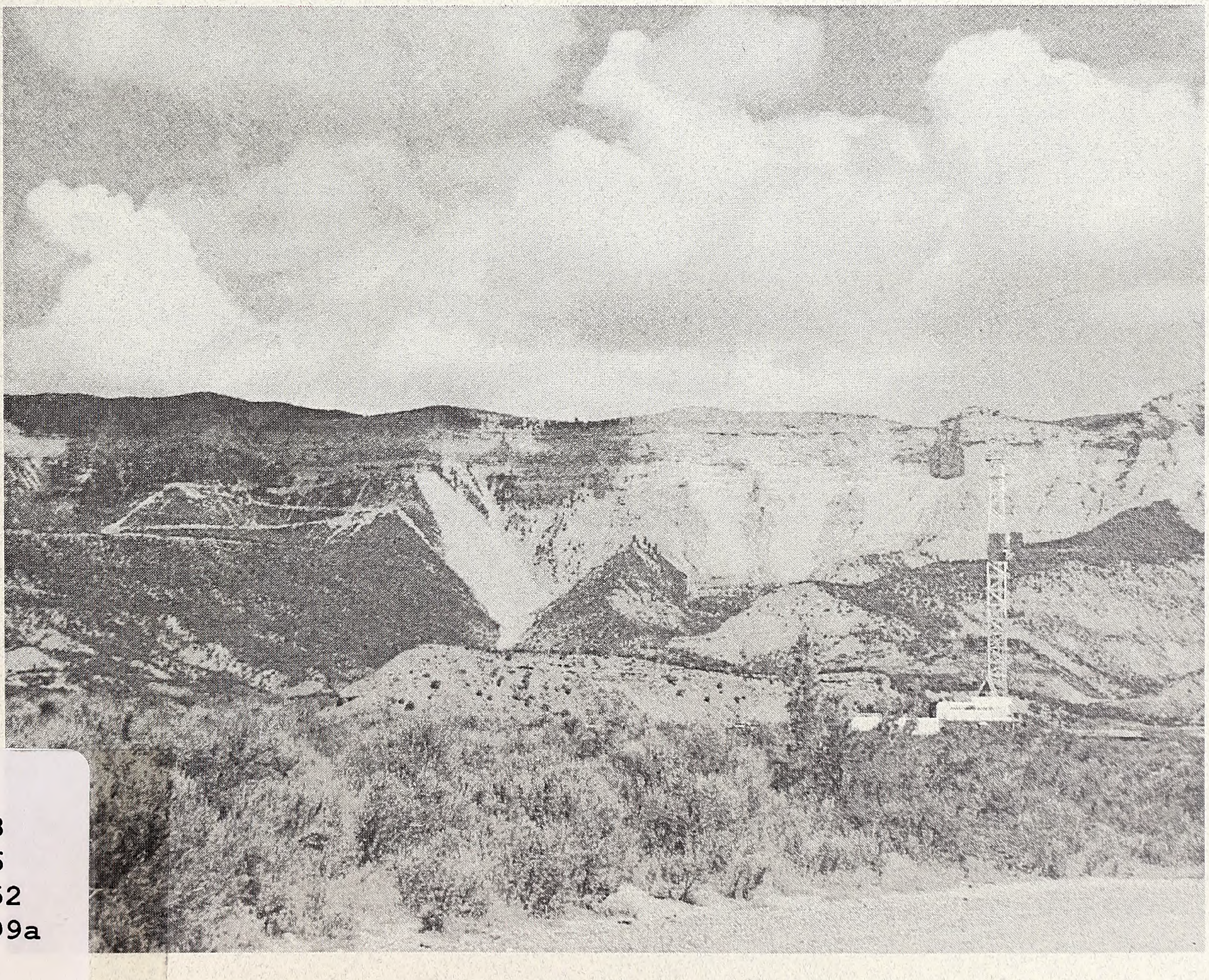
Glenwood Springs Resource Area

Oil & Gas Leasing & Development

Final Supplemental Environmental Impact Statement

January, 1999



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Glenwood Springs Resource Area
Oil and Gas Leasing and Development
Final Supplemental Environmental Impact Statement

Draft [ ] Final [X]

Lead Agency: Department of Interior, Bureau of Land Management

Cooperating Agencies: None

Type of Action: Administrative [X] Legislative [ ]

This is the Glenwood Springs Resource Area, Oil and Gas Leasing and Development, Final Supplemental Environmental Impact Statement (SEIS). The SEIS serves to amend the oil and gas leasing and development decisions contained in the Resource Management Plan (RMP) for the Glenwood Springs Resource Area (GSRA). It also includes changes to the Draft SEIS and Proposed Action Alternative based on public comments.

For further information, contact:

Steve Moore, SEIS Team Leader
P.O. Box 1009
BM, Glenwood Springs Resource Area
Glenwood Springs, CO 81602

Phone: 970-947-2800

Protests due: March 1, 1999

Date Released: January 29, 1999

Distribution List: The final SEIS will be mailed to all government agencies, organizations, associations and corporations listed in the Comments Index. Additionally, the Final SEIS or an Executive Summary is being mailed to many of the individuals who commented or who participated in the process in some way.

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United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Glenwood Springs Resource Area
50629 Highway 6 and 24
P.O. Box 1009
Glenwood Springs, Colorado 81602

IN REPLY REFER TO:

1793
CO-078

January 29, 1999

Dear Reviewer,

Enclosed is the Final Supplemental Environmental Impact Statement (SEIS) and Proposed Resource Management Plan (RMP) Amendment for Oil and Gas Leasing and Development in the Glenwood Springs Resource Area (GSRA) of the Bureau of Land Management (BLM). We have attempted to be responsive to the comments of nearly 500 reviewers of the Draft SEIS, published in June, 1998. The Preferred Alternative in the Final SEIS is a refinement of the Proposed Action Alternative presented in the Draft SEIS.

The BLM's planning regulations (43 CFR 1610.5-2) provide for an administrative review by the BLM Director for those who participated in the planning process and who will be adversely affected by selection of the Preferred Alternative and approval of the Proposed RMP Amendment. Procedures for filing a protest follow this letter.

Following completion of a Governor's consistency review and the protest period, a Record of Decision will be issued. This will occur sometime in March, 1999. At that time, the Proposed RMP Amendment, excluding any portions under protest, will become final. Approval will be withheld on any portion of the Proposed RMP Amendment under protest until a final determination on the protest has been made by the Director of the BLM.

It is important to remember that the overall objective of the SEIS is to facilitate orderly, economic and environmentally sound exploration and development of oil and gas resources using balanced multiple-use management. Finding such a balance between such land use and resource protection in the rapidly changing environment of western Colorado is difficult but important. Often the measure of success in achieving a proper balance is a matter of perspective or interest. Sometimes only time will tell. It is my hope that visitors to public lands in the GSRA will see themselves not as winners or losers, but as stakeholders who helped make reasonable choices.

I appreciate the time and effort of all those who chose to become involved in the process. While not all reviewers will be completely satisfied with all elements of the Preferred Alternative, I hope all will find the document reasonable and responsive.

Sincerely,

Michael S. Mottice

Michael S. Mottice
Glenwood Springs Resource Area
Area Manager

Protest Procedures

Who May Protest?

Only persons who participated in the planning process and have an interest which is or may be adversely affected by this amendment to the Glenwood Springs Resource Management Plan may protest. If our records do not indicate that you had any involvement in the planning process your protest may be dismissed without further review.

What May be Protested?

A protest may raise only those issues which were submitted for the record during the planning process. New issues should be directed to the Mike Mottice, Glenwood Springs Field Office Manager, for consideration during implementation, as a potential plan amendment, or as otherwise appropriate.

How do I Protest?

If you file a protest, your protest must be postmarked no later than March 1, 1999. Although not a requirement, we suggest that you send your protest by certified mail, return receipt requested.

Where shall all protests be filed?

The mailing address is:

Director, Bureau of Land Management
Attention: Ms. Brenda Williams, Protest Coordinator, WO-210/LS-1075
Department of Interior
1620 L Street, N.W. Rm. 1075
Washington, DC 20036

(Phone: 202-452-5110)

To expedite consideration, in addition to the original sent by mail or Overnight Mail, a copy of the protest may be sent as follows:

Fax to 202-452-5112 or
E-mail to bhudgens@wo.blm.gov

In addition, BLM requests that a copy of the protest be sent to:

Oil and Gas SEIS-Protest
Attn: Steve Moore
Bureau of Land Management
Glenwood Springs Resource Area
P.O. Box 1009
Glenwood Springs, CO 81602

What information must the protest contain?

1. The name, mailing address, telephone number, and interest of the person filing the protest.
2. A statement of the issue or issues being protested.
3. A description of the part or parts of the amendment being protested. To the extent possible, provide reference to specific pages, paragraphs, sections, tables maps, etc.
4. A copy of all documents addressing the issue or issues that you submitted during the plan amendment process, or reference the date(s) the issue or issues were discussed by you for the record.
5. A concise statement explaining why the proposed decision is believed to be incorrect. Please include relevant facts, corroborating evidence, and references that support your position.

Glenwood Springs Resource Area
Oil and Gas Leasing and Development

Final Environmental Impact Statement

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Executive Summary

Introduction

In November 1991, the Bureau of Land Management (BLM) amended the Resource Management Plan (RMP) for the Glenwood Springs Resource Area (GSRA), as described in the Colorado Oil and Gas Leasing and Development Final Environmental Impact Statement (FEIS) of January, 1991.

When the FEIS was prepared, only limited oil and gas development had occurred in the GSRA. However, the level of development activity began to increase soon after completion of the FEIS and was concentrated in a relatively small area in the Interstate 70 corridor from Silt to Parachute. As many as 25 wells per year have been approved on BLM land in this area in recent years and a high level of development is expected to continue into the future.

Therefore, a decision was made to complete a new evaluation of the impacts of oil and gas leasing and development on BLM lands and federally owned mineral estate under private lands in the GSRA. On April 21, 1997, the GSRA published in the Federal Register a Notice of Intent (NOI) to begin a Supplemental Environmental Impact Statement (SEIS) and RMP Amendment on oil and gas leasing and development and initiated a scoping period.

While the SEIS was being prepared, Congress passed Public Law 105-85, the Department of Defense Authorization Act of 1998 (included in Appendix C of the Draft SEIS). Section 3404 of the Act called for the transfer of all 56,000 acres of the Naval Oil Shale Reserves (NOSR) near Rifle, Colorado, from the Department of Energy (DOE) to the Department of the Interior (DOI), to be managed by the BLM, and mandated that the oil and gas reserves of the developed portion of the NOSR be offered for lease by November 18, 1998. Because of the area's physical nature is similar to the surrounding BLM land, the GSRA decided to include the developed portion of the NOSR in the SEIS. Notice of this decision was published in the Federal Register on March 17, 1998. The Draft SEIS was released for public review on June 19, 1998. The period for commenting on the Draft SEIS ended on November 23, 1998.

This is the Final SEIS on Oil and Gas Leasing in the GSRA of the BLM. The leasing decisions in this SEIS constitute an amendment to the RMP which will supersede all previous oil and gas leasing decisions.

The SEIS includes the entire GSRA (568,000 acres of public land from Edwards to DeBeque and from Aspen to Toponas) but most of the analysis will focus on the area with the highest potential for oil and gas development, referred to as Region 4 in the SEIS. Outside Region 4, only one well has been drilled since the FEIS was prepared and there are currently no active, producing oil and gas wells. Additionally, the developed portion of the NOSR (referred to as the NOSR Production Area) will receive special attention.

Purpose of the SEIS

The purpose of the SEIS is: 1) to comply with the FEIS mandate for a review of environmental effects when the number of wells exceeded the Reasonable Foreseeable Development (RFD) scenario; 2) to provide public disclosure of the impacts of a level of development greater than originally anticipated; 3) to provide an improved information base for managing gas development impacts; 4) to prepare a set of management objectives or standard operating procedures that could be used to manage future oil and gas development; 5) to review and modify lease stipulations that could be applied to future leases and thereby amend the RMP, and; 6) to develop mitigation measures to be applied to new leases in the NOSR.

This SEIS does not authorize the construction of any individual well locations. A separate Environmental Assessment (EA) would be prepared in the future for individual Applications for Permits to Drill (APDs). EAs for APDs are more site-specific and include on-the-ground inventories for cultural resources and sensitive plant and animal species. The EA process includes an on-site exam in which the BLM, the operator and interested stakeholders view the proposed well location in the field to make appropriate adjustments to the location or design of the wellpads and roads.

Future EAs will tier to this SEIS as much as possible to avoid duplication of paperwork. The EAs will focus on site-specific, on-the-ground issues and will not deal with those larger issues addressed in the SEIS.

Objective of the SEIS

The overall objective for the SEIS is the same as the objective in the FEIS; to facilitate orderly, economic and environmentally sound exploration and development of oil and gas resources using balanced multiple-use management. BLM is not proposing changes to the major decisions in the FEIS, namely that: 1) the entire Federal mineral estate in the GSRA (now including portions of the NOSR), except Wilderness Study Areas (WSAs), would be open for oil and gas leasing and development; 2) BLM would apply No Surface Occupancy stipulations, Timing Limitations, Controlled Surface Use stipulations and Lease Notices as appropriate to all new leases, and; 3) BLM will develop appropriate Conditions of Approval (COAs) for all APDs for leases issued prior to the FEIS, provided the COAs are consistent with lease rights granted.

Although the lease stipulations and COAs described in the SEIS were developed to apply to oil and gas leasing and development, it is intended that the same or similar measures will be applied to other public lands uses in order to maintain or achieve the same resource conditions and to assure equitable treatment to all public lands users. Additional administrative measures may be needed to determine how to best apply comparable measures to other uses.

Issues

Issues and concerns were identified during the two public scoping periods for this SEIS, through public comments noted by the BLM during the processing of individual APDs, and at various public meetings on the subject of oil and gas development in Region 4 over the past several years. Following are the primary issues discussed in the SEIS.

Lease Rights. Except for the NOSR Production Area, most of the high potential gas production area (Region 4) in the GSRA is already held by oil and gas leases which were issued prior to the completion of the FEIS. Those leases transferred rights to the oil and gas reserves, limited by the standard lease terms, but largely without any special stipulations. This situation constrains the ability of BLM to fully implement some of the stipulations approved in the FEIS. The FEIS committed BLM to apply the stipulations as COAs, to the extent they are consistent with lease rights. Concern has been expressed that BLM has thus been unable to manage oil and gas development as called for in the FEIS.

Reclamation and Soils. Reclamation in semi-arid environments is a very slow process. The risks of unsuccessful reclamation are higher when disturbance occurs in steep and erosion-prone soils. How successful have BLM's reclamation efforts been?

Riparian Community. Riparian zones include some of the most productive and valuable vegetation communities in Region 4; at the same time, topography sometimes dictates that potential well sites and roads be placed directly in or adjacent to these areas. How extensively have riparian zones been affected and how can they be better protected?

Wildlife. Many species of wildlife are affected by the loss of habitat and disturbance from human activities, especially at critical times. Construction of roads and wellpads removes vegetation and reduces the utility of the affected habitat. More importantly, new roads and new traffic on existing roads may displace wildlife from a habitat area.

Visual. The surface disturbance caused by gas development alters the natural landform so that the visual character is affected. The production facilities left on the completed wellpad also alter the landscape character. Much of the development occurs in the I-70 corridor and hence is visible to many visitors as well as residents of the area.

Social and Economic. Gas drilling is an economic activity that produces an essential energy fuel and is generally considered to have a positive effect on local economies. However, the degree of activity may affect the residential character of the area and adversely impact local infrastructure, in particular, the road system.

Quality of Life. Public lands within the GSRA provide a variety of benefits to adjacent landowners and communities, including contributions to a person's quality of life. Some see oil and gas development as an economic opportunity, an important and legitimate use of natural resources, that offers a secure lifestyle and diversifies a local economy while contributing to the nation's demand for fuel. Other's view the same development as a negative impact on their property values, an over-emphasized use of public lands, that detracts from their lifestyle choices while benefitting only those associated directly with the industry.

Air Quality. Emissions discharged from the wellhead in venting and flaring activities and dust and exhaust from construction and maintenance activities can affect local residents. Emissions from compressor stations may contribute to overall air quality deterioration and affect Class I airsheds.

There have been numerous general statements from the public expressing concern for the nuisance (odor, dust, smoke, exhaust emissions, poor visibility) posed by oil and gas activities. In addition, formal complaints in which citizens experienced breathing difficulties, eye irritation and nausea have been noted. Since operations on public land are often removed from residences, most such complaints involve operations on private lands.

Groundwater. In the summer of 1997, natural gas and drilling fluids from an oil and gas well on private mineral estate migrated into a domestic water well approximately one mile away. There are concerns that such problems could occur again on other wells.

Project Rulison. On September 10, 1969, a 43 kiloton nuclear device was detonated six miles southeast of Parachute, Colorado, to fracture rock and release gas in a formation 8,426 feet below the surface. The public is concerned about possible radioactive contamination from Project Rulison.

Transportation Systems. Well drilling rigs and support equipment travel from site to site and may affect local traffic patterns, damage roads, and create safety issues. This issue is primarily related to County roads, under the jurisdiction and control of Garfield County. County roads tend to be narrow, winding roads, designed for farm-to-market, light-volume, light-duty traffic. Oil and gas equipment may sometimes exceed the design of the roads, creating safety issues and requiring extra maintenance. BLM requires that the operator obtain all necessary local permits, including the hauling permits required by Garfield County.

Hazardous Materials. In the summer of 1997, workers at the Anvil Points Landfill complained of irritating emissions during the flaring of a nearby gas well on split estate. Operations at that well were subsequently modified to correct the problem, but complaints about the adequacy and timeliness of the operator and BLM's response suggest a need for greater attention to such matters in the future.

Alternatives

Three alternatives were developed to address the issues. They include a Continuation of Current Management (CCM) Alternative, a Maximum Protection (MP) Alternative and a Proposed Action (PA). The alternatives are defined in terms of the tools available to BLM to manage and mitigate the impacts of oil and gas leasing and development. Those tools are: the standard lease terms which provide BLM broad regulatory control of oil an gas operations and authorize BLM to delay drilling activity for up to 60 days or relocate a proposed well up to 200 meters; lease stipulations, including No Surface Occupancy (NSO), Timing Limitations (TL) and Controlled Surface Use (CSU); Conditions of Approval (COA) which may be applied at the time of development, and Lease Notices, which alert lessees to the need for inventories or other special requirements.

Continuation of Current Management (CCM) Alternative. The CCM Alternative in this SEIS is the same as the Proposed Action in the FEIS. It includes 27,280 acres of no leasing in four WSAs, about 175,000 acres of NSO stipulations for the protection of wildlife, watershed and recreation values, a group of TL stipulations for the protection of wildlife, and CSU stipulations for the protection of coal mines, riparian, watershed and visual resources.

Maximum Protection (MP) Alternative. The MP Alternative includes all the elements of the CCM Alternative and additional or modified provisions aimed at increasing the protection of surface resources and minimizing adverse environmental impacts. The alternative adds more stringent restraints on operations in riparian areas, protects wildlife seclusion areas, provides stricter control of surface disturbing activities when slopes exceed 25 percent, and more closely defines protection of visual resource.

The Proposed Action (PA). The Proposed Action was developed to accomplish the following objectives:

1. Provide a reasonable balance between surface resources and subsurface values.
2. Be consistent with Federal and State laws and policies.
3. Consider the long-term as well as the short-term and not preclude options for the future.
4. Be understood by all stakeholders.
5. Acknowledge public concerns.
6. Establish BLM's preferred management objectives and best management practices, even if current lease rights might preclude such options.
7. Acknowledge BLM's multiple-use mandate.
8. Support BLM's Land Health Standards.

Alternatives Considered but Not Included.

No Leasing Alternative. This alternative was not included because the FEIS confirmed the decision of the GSRA Resource Management Plan that all lands except WSAs would be available for oil and gas leasing.

Maximum Production Alternative. This alternative was not included because the FEIS evaluated a Standard Lease Terms and Conditions Alternative which essentially provides for the legal minimum restrictions on oil and gas operation, thus accomplishing the intent of a Maximum Production Alternative. The FEIS concluded that this alternative was not adequate and that additional protective measures were needed.

No Action Alternative. The No Action Alternative would amount to no change in the way BLM currently manages oil and gas operations. The Continuation of Current Management Alternative included in this SEIS adequately accomplishes the intent of a No Action Alternative so the No Action Alternative was not included in the SEIS.

The Preferred Alternative

The Preferred Alternative was based on a review of the approximately 500 cards and letters received by the BLM during a 5 month comment period on the Draft SEIS. It is BLM's intent that the Preferred Alternative accomplish the same objectives established for the Proposed Action but be responsive to the comments received. To achieve these objectives, all actions conducted on public lands must be subject to the same or comparable terms and conditions. It is therefore intended that the same or similar measures will be considered for application to other public land uses

Primary Elements of the Preferred Alternative. In comparison to the Continuation of Current Management Alternative, the primary elements of the Preferred Alternative are: 1) identification and protection of Wildlife Seclusion Areas; 2) identification and protection of Recreation Management Areas for non-motorized recreation opportunities; 3) increased protection for the most visually sensitive slopes within the Interstate 70 (I-70) viewshed; 4) establishment of a CSU affecting lands within 500 feet of a riparian area; 5) reducing the slope protected with a CSU from 40 to 30 percent, 6) establishment of an NSO to protect slopes over 50 percent, and; 7) establishment of a Lease Notice which directs the operator regarding implementation of habitat mitigation projects. Additionally, the Final SEIS documents a protocol for managing operations under existing leases which calls for more comprehensive planning within a lease area.

Rationale for the Preferred Alternative. In addition to accomplishing the objectives described above, the Preferred Alternative was designed to address specific resource protection needs documented in Chapter 4, Environmental Consequences. In most cases, impacts from oil and gas development activities on federal mineral estate in Region 4 are not the primary cause of the landscape alterations that have contributed to a variety of direct and indirect natural resource impacts. Rather, it is the cumulative nature of the impacts associated with residential, agricultural and other commercial land uses, including the extensive transportation system of federal and state highways and county roads that has necessitated the changes in current oil and gas operating procedures described in the Preferred Alternative.

Evaluated independent of other land uses, some of the measures may seem unnecessary. However, in the context of the overall landscape modifications to date as well as trends, it is apparent that oil and gas activities will continue to influence natural landscapes sufficient to warrant reasonable additional measures to reduce impacts of oil and gas development. This would result in a reduction of the contribution by oil and gas operations to the overall cumulative impacts of all human land uses throughout Region 4. Therefore, certain measures like the Wildlife Seclusion Areas NSO and Wildlife and Wildlife Habitats Lease Notice were included in the Preferred Alternative, though such measures would perhaps not have been considered necessary in more remote parts of the state that have not already been affected by a variety of development and land uses.

Despite the fact that additional restrictions will make some public lands less available for oil and gas development and/or increase the costs of oil and gas extraction sufficient to make some well locations uneconomical, BLM believes that the additional protective measures are warranted in order to accomplish the objectives of the Proposed Action. This additional protection is not without economic tradeoffs, however. The Final SEIS, Chapter 4, Part 4.20.2.3 estimates that the Preferred Alternative will result in the loss or postponement of gas production from the federal mineral estate of less than 4 percent compared to the Continuation of Current Management Alternative. However, this loss is not expected to change employment levels nor does it represent a significant percentage of total gas production in Colorado.

The basis for many of the additional protective measures included in the Preferred Alternative was founded in the FEIS. However, BLM experience with oil and gas operations in Region 4 since the FEIS and the additional analysis provided in the SEIS, suggest refinements of the current protective measures are necessary to better accomplish the goals established in the FEIS. For example, while the FEIS committed to protecting Visual Resource Management (VRM) Class II areas, BLM has determined that the associated CSU may be inadequate in those situations where special design considerations or even moves of greater than 200 meters may be inadequate to achieve VRM Class II objectives. As such, the Preferred Alternative includes an NSO that gives BLM authority to actually deny well locations on a case-by-case basis if necessary to achieve VRM Class II objectives. While BLM feels that the CSU would have been adequate in most instances, it is important that BLM have the necessary authority to more fully achieve the objective even in the more unusual situations.

Some elements of the Preferred Alternative reflect new information or new issues not specifically addressed in the FEIS. For example, the FEIS included little acknowledgement of the potential impacts of oil and gas operations on quality of life of nearby residents nor did the FEIS specifically include measures to protect non-motorized recreation opportunities. The FEIS discussed visual resources, but a much more refined analysis is provided in the SEIS. Finally, though the FEIS included cumulative impacts analysis, the SEIS contains a much more regional cumulative impacts analysis that provides a better foundation to understand environmental consequences and consider appropriate protective measures.

The Preferred Alternative and the Proposed Action. The Preferred Alternative contains most of the elements of the Proposed Action. Primary differences between the No Surface Occupancy (NSO) stipulations are: 1) The Preferred Alternative provides an exception for the Wildlife Seclusion Areas NSO when a mitigation plan is approved; 2) The slope of the NSO for steep slopes was increased from 35 percent in the Proposed Action to 50 percent in Preferred Alternative; 3) The exceptions for the NSOs in the Recreation Management Areas were removed, except those for several designated roads in the King Mountain and Pisgah Mountain areas, and; 4) The Sensitive Viewsheds NSO and the Roan Cliffs Scenic Area NSO in the Proposed Action were replaced with an I-70 Viewshed NSO in the Preferred Alternative.

All Timing Limitations of the Proposed Action were incorporated in the Preferred Alternative.

Primary differences between the Controlled Surface Use (CSU) stipulations are: 1) The Perennial Water Impoundments and Springs CSU was dropped from the Preferred Alternative; 2) The Sensitive Viewshed CSU in the Proposed Action was dropped and replaced with a more comprehensive Lease Notice in the Preferred Alternative; and 3) The VRM CSU in the Proposed Action was modified to drop the reference to Class III areas which are covered in the Sensitive Viewshed Lease Notice in the Preferred Alternative.

All the Lease Notices of the Proposed Action were incorporated into the Preferred Alternative, with minor modifications to the wording of some notices.

Environmental Consequences

Reasonable Foreseeable Development Scenario (RFD). The RFD used in the SEIS for the analysis of impacts is the level of oil and gas development activity that an objective reviewer might reasonably expect to occur over the next 20 years. The RFD assumes 1,200 wells could be constructed in Region 4 over the next 20 years, 300 of those on federal mineral estate. Of the 300 wells on federal mineral estate, 70 are assumed to be drilled in the NOSR Production Area. The RFD is not a prediction of future activity but rather an assumed level of future activity based on average activity levels experienced over the past five years. The actual amount of future oil and gas development activity is dependent on many factors, like commodity prices, changes in technology, availability of infrastructure to transport the product, inflation, capital availability, legislation, and taxes.

Threatened and Endangered Plants and Animals. To date, few BLM-approved oil and gas activities have affected threatened and endangered plants and animals. Federal and State-listed threatened and endangered species would continue to be protected under all alternatives. As the extent of oil and gas development on public lands increases, it is more likely that certain important plants or plant communities not protected by the Endangered Species Act or listed on state or federal sensitive species lists could be affected.

Riparian and Wetlands. There are approximately 3,525 acres of riparian habitat in Region 4, about twelve percent on public land. On all lands, 41 percent of the riparian areas are already at least indirectly impacted by roads (not just oil and gas roads). Indirectly impacted riparian areas are those riparian areas within one-eighth mile of a road. About three percent of the total riparian area in Region 4 has been affected by BLM oil and gas-related activities.

Oil and gas activities have probably caused little impact to riparian areas in Region 4 when compared to other types of human disturbance. Most of the riparian areas are on private lands not controlled by BLM or subject to the mitigation measures proposed in this SEIS. Throughout Region 4, an additional 34 percent of the riparian areas might be affected over the 20 year planning period. Added to current levels of impact, more than 70 percent of the riparian areas in Region 4 could ultimately be affected.

The cumulative impact to these important areas suggests the need to minimize additional impacts to already affected riparian areas and to protect those areas still generally undisturbed.

Wildlife. Elk and mule deer are the wildlife species most clearly affected by oil and gas development in Region 4. Adverse effects are primarily associated with the loss of habitat effectiveness which extends well beyond the boundaries of the actual site disturbance. This loss of habitat effectiveness occurs because human activities in wildlife habitats displace wildlife. This is especially important in winter range. Some impacts may be offset by mitigation efforts that either improve habitat or reduce the level of human disturbance.

The direct effect of oil and gas development on deer and elk habitat in Region 4 to date amounts to less than one percent of total mule deer and elk winter range. However, since much of the oil and gas development presently occurs within five zones of more concentrated development, the impacts within those areas are more substantial. The total indirect, or displacement effect, of all roads from all uses (I-70, residential, state and county roads, towns, oil and gas development, etc) on mule deer winter range was estimated at 151,590 acres, or 55 percent of the mule deer winter range in Region 4. The portion of this impact attributable to gas development on public mineral estate was estimated at 2.7 percent. Elk winter range affected by all uses amounts to 245,357 acres, or 94 percent of the total elk winter range in Region 4. About three percent of this total is attributable to gas development on public mineral estate.

The cumulative effect on mule deer habitat from the future development of 1,200 wells in Region 4 would include a direct impact on an additional 3,590 acres and an indirect effect on an additional 28,200 acres of winter range, representing about 11 percent of the total mule deer winter range in Region 4. The cumulative effect of future oil and gas development on elk winter habitat would be a direct impact on 2,162 acres and an indirect impact on 14,628 acres, representing approximately 20 percent of the elk winter range in Region 4.

Along with future oil and gas development, the overall cumulative assessment must consider on-going development associated with residential uses of land in Region 4. The continual increase in the road system in important winter habitat and the corresponding reduction of habitat effectiveness argues for the need to also consider measures to protect some of the few remaining areas of high quality wildlife habitat.

Soils. The total amount of surface disturbance associated with oil and gas development is a primary factor in determining impacts to soils. To date, less than one percent of the soils in Region 4 have been affected by oil and gas activities on federal mineral estate. Construction of 1,200 additional wellpads may result in a large amount of soil being moved locally in the short-term, resulting in sedimentation of nearby streams and some loss of site productivity. However, the overall cumulative effect on soils from oil and gas development on BLM lands would be minor because in most cases, increased erosion from oil and gas activities in Region 4 would not be distinguishable from already high natural erosion rates.

Nonetheless, BLM will continue to take reasonable and prudent measures to minimize erosion resulting from oil and gas activities and retain as much as possible the productivity of the affected sites.

Surface Water. Oil and gas activities have resulted in minimal adverse impacts to water resources to date. The short-term impacts to surface water are primarily an increase in sediment and, potentially, salinity that occurs while the surface is disturbed. Surface water is most susceptible to sediment and salt yield while facilities are under construction. Within days following completion of drilling, measures to mitigate the disturbed site are implemented. Generally, sediment and salt yield are slightly higher on recently rehabilitated sites and decrease over time to a negligible level.

The future impacts to surface water would be about the same for all alternatives. The 1,200 new wells would cause a surface disturbance of an estimated 4,080 acres. Approximately 1,020 acres of public land and 3,060 acres of private land would be disturbed. This surface disturbance would result in a short-term increase in sediment and salinity in surface waters and a potential increase in peak flows. Most of the area being developed is dry with runoff only occurring occasionally throughout the year. When runoff events do occur, sediment, salt, and other pollutant increases coming from oil and gas facilities are indistinguishable from those coming from undisturbed areas in the rest of the basin. The intensity and duration of these impacts would be reduced by effective mitigation including water bars for roads, siting locations and roads away from drainages, maintaining riparian buffers, and others.

Visual. Visual impacts were evaluated by analyzing the visual sensitivity of the locations of wells and related access roads from several viewpoints: I-70, Battlement Mesa, Parachute Creek, Holms Mesa, the town of Rifle and Highway 13. The impact of gas development activities generally depends on the character of the landscape and the visual contrast of modifications to the landform and vegetation features, and the size, color and shape of structures. During drilling operations, newly constructed pads and roads with bare cut and fill slopes are noticeable and attract attention. The drilling rig and related equipment, flaring operations and associated traffic also attract attention and are noticeable from a distance.

With the assumed future development and a continued pattern of well site locations, all of the viewsheds will be affected by a noticeable increase in visual impacts from gas development. Visual impacts of development under new leases in the NOSR Production Area in the I-70 viewshed would be reduced by a NSO stipulation that limits the visual impact of development on slopes over 30 percent in the I-70 viewshed.

Visual impacts of gas development on non-BLM land will be noticeable and attract attention and are likely to dominate the immediate scenery in some places because a lot of the private lands are located in the foreground view.

Groundwater. The overall potential for contamination of usable water zones and domestic groundwater from BLM-approved gas drilling operations is considered to be very low under all alternatives for several reasons: the requirements that operators isolate and protect usable water zones; the relatively few domestic water wells on or near public lands; and the limited amount of water-bearing zones on public lands

Transportation. Under all alternatives, BLM will continue to require appropriate measures of the operator for construction and maintenance of roads on BLM lands and to require that the operator obtain all necessary local permits, including the hauling permits required by Garfield County. Such measures will do little to address the issues raised by citizens concerning the Garfield County road system.

Social and Economic. The oil and gas industry is a very visible economic presence in parts of Garfield County but does not, overall, support a large portion of the jobs in the county. Given that the BLM-controlled oil and gas activity in Region 4 is only about 20-25 percent of the total activity and that the variation in number of wells drilled on public lands under each alternative is not substantial, it is likely that any shortage of well drilling opportunities on public lands would be made up by drilling on private lands, especially in the short term. Thus, little impact to local economies is expected under any of the alternatives.

Minerals. Each well represents about 1.5 Billion Cubic Feet (BCF) of natural gas and so every well location denied by BLM represents a potential loss of this production and associated revenues. This is of particular concern on the NOSR as the fewer future well sites permitted on these lands the longer the time needed to recoup the U.S. Government's investments in the wells and pipelines already on the property and, therefore, the longer it would be before any revenue would be shared with the State of Colorado under the Minerals Leasing Act. Due to proposed restrictions to be placed on gas well locations in the NOSR Production Area, it is estimated that, for the NOSR, the PA would result in the loss of five well sites, potentially producing 7.5 BCF of natural gas, and the MP Alternative would result in the loss of 15 well sites, potentially producing about 22.5 BCF of natural gas. Some or all of the production loss could eventually be offset by directional drilling from other locations, but operator costs would be increased. Increased operator costs would not affect production and revenues until such costs became prohibitive and the operator chose not to drill. No alternative is expected to substantially affect the overall amount of oil and gas drilling activity in Region 4.

Project Rulison. Evaluation of current data from extensive pre- and post-detonation technical studies and evaluations, reports concerning site cleanup and remediation, and monitoring data indicates that any radionuclides that may be present are contained within the chimney cavity and fracture zone. The probability of radionuclides migrating from the chimney cavity and fracture zone created by the nuclear detonation is extremely low. This is due to the limited chimney cavity and fracture zone radius, the lenticular geometry of the Williams Fork sandstones, as well as their low permeability and porosity, and the lack of contaminated gas left in the cavity and fracture zone.

Based on review of available data, BLM has concluded that radioactive materials were most likely confined within the cavity and contained within the 40-acre spacing unit of the well. As a precaution, BLM requires all drilling on federal mineral estate within three miles of Project Rulison be consistent with Colorado Oil and Gas Conservation Commission (COGCC) guidelines calling for the Department of Energy (DOE) to review all well locations for possible inclusion in DOE's on-going monitoring program.

Air Quality. No significant, adverse impacts to air quality are anticipated from implementation of any of the alternatives. Localized short-term increases in particulate matter, carbon monoxide, nitrogen dioxide, and ozone concentrations would occur, but maximum concentrations would be well below applicable ambient air quality standards. Similarly, hazardous air pollutant concentrations would be well below standards, and the related short- and long-term cancer risks (to well rig operators and nearby residences) would be below significance levels.

While all alternatives require operations be consistent with air quality standards, it is recognized that during some time periods (usually associated with constructing and preparing gas wells to go "on-line" for production) some people will find the operations irritating and annoying. Others with certain chemical sensitivities or breathing difficulties may actually find the operations unhealthy.

Provided the operators continue to use equipment at the compressor stations that exceeds current State of Colorado emission standards, there will be no impacts to Class I airsheds from oil and gas operations.

Quality of Life. The impact to the quality of life of residents in the proximity of oil and gas development activities and the degree to which oil and gas development is or is not compatible with residential development is dependent on the perspective of the resident. Generally, some will see oil and gas development as a positive factor in their lives while others will view such activities as negative.

Positive impacts include opportunities for keeping secure and well paid employment, contributing towards economic diversification of local economies, providing greater access to public lands for recreation and other uses, increasing tax revenues, and supplying a needed source of energy.

Negative impacts include an increase in the dust, traffic and noise in certain residential areas at certain times of the year, and an increase in the amount and extent of modifications to the natural landscape which in turn affect the overall landscape character, potentially changing an area from a more natural setting to a more industrial setting.

Public Review of the Draft SEIS

BLM reviewed comments from approximately 500 reviewers. Numerous adjustments were made to the Final SEIS based on the public comments. The primary comments are highlighted here:

- BLM is ignoring its multiple-use mandate in favor of recreation and other resources.
- BLM has traded off its multiple use mandate and unduly supported the oil and gas industry.
- The oil and gas industry has a good track record of successful operations and little change from current management is needed.
- There are numerous on-the-ground problems associated with oil and gas operations and BLM needs to adopt much stricter measures to protect surface values.
- The level of analysis outside Region 4 is inadequate. BLM should do a separate analysis for lands outside Region 4 and include the "no leasing" alternative.
- BLM has not adequately considered the impacts of oil and gas leasing on recreation values in Eagle County, especially on the Special Recreation Management Areas and Recreation Management Areas. The exceptions to the proposed NSO stipulations for these areas are unclear and should be removed.
- There appears to be little variation in the impacts across the alternatives. Therefore, BLM should select the Continuation of Current Management Alternative.
- With so little changes in the impacts to the numbers of wells drilled in each alternative, BLM must select the Maximum Protection Alternative.
- BLM has not considered the impacts of oil and gas operations on the scenic quality of residential areas nor the impacts to the resident's quality of life.
- BLM has understated the degree of regulation of the industry. BLM has no acknowledged the industry's commitment to addressing problems with oil and gas activities near residential areas and the importance of the oil and gas industry to the quality of life of many residents.
- The level of protection proposed for the NOSR Production Area is overly protective and not based on sound science and will result in significant reductions in the development potential for this highly valuable natural gas resource.
- All stipulations must have reasonable exceptions to account for specific, on-the-ground applications.
- The stipulations have too many exceptions that will result in unacceptable impacts to a variety of resources.
- BLM's reclamation standards are too low and not based on sound sampling techniques. BLM does not hold the operator accountable for reclamation and success is not satisfactory.
- Reclamation on BLM lands has been successful and the operators are committed to achieving BLM's reclamation goals.
- BLM has not been willing to implement the direction of the FEIS, for example, BLM has not required habitat mitigation projects for wildlife.
- BLM needs to be more clear on how operations under existing leases will be managed and which lease stipulations are consistent with lease rights.

Managing Existing Leases

The Final SEIS includes a revised Chapter 2 with a new section on Managing Existing Leases. The Final SEIS also establishes a Protocol for managing oil and gas operations under existing leases. The primary elements of the Protocol are: 1) at the time new drilling proposals are initiated, BLM will require the operator to submit more comprehensive plans for operator controlled federal leases within the geographic area covering a minimum time period of 2-3 years, and; 2) BLM will require any/all of the mitigation measures described in the Preferred Alternative that are appropriate and are consistent with lease rights.

In those cases where mitigation measures might be inconsistent with lease rights, BLM will seek voluntary compliance from the operator or develop alternative mitigation measures to accomplish the objectives of the Preferred Alternative.

Consultation and Coordination

The BLM in its Glenwood Springs Resource Area, Grand Junction District and Colorado State Offices has an ongoing working relationship with the U.S. Forest Service, the Colorado Oil and Gas Conservation Commission and the Colorado Division of Wildlife. That working relationship has continued throughout the development of this document. Garfield County participated in identifying issues and potential solutions. Consultation with the U.S. Fish and Wildlife Service on threatened and endangered species was initiated during the FEIS, continued through this process, and will continue throughout oil and gas development in Region 4. The GSRA had numerous and frequent interactions with residents of the area and with several organized groups, in particular the Battlement Mesa Service Association and the Grand Valley Citizens' Alliance.

Approximately 500 persons commented on the Draft SEIS during a 150 day public review period. Those comments are summarized with responses from the BLM in Chapter 5 of the Final SEIS.

Chapter One

PURPOSE AND NEED

1.1 Introduction

In November 1991, the Bureau of Land Management (BLM) amended the Resource Management Plan (RMP) for the Glenwood Springs Resource Area (GSRA), as described in the FEIS of January, 1991. At the time the FEIS was being prepared, only limited oil and gas development had occurred in the GSRA. However, the level of development activity began to increase soon after completion of the FEIS. As many as 25 wells per year have been approved on BLM land in this area in recent years and such rates are expected to continue into the future.

Therefore, a decision was made to complete a new evaluation of the impacts of oil and gas leasing and development on BLM lands in the GSRA. On April 21, 1997, the GSRA published in the Federal Register a Notice of Intent (NOI) to begin a Supplemental Environmental Impact Statement (SEIS) and RMP Amendment on oil and gas leasing and development and initiated a scoping period.

While the SEIS was being prepared, Congress passed Public Law 105-85, the Department of Defense Authorization Act of 1998 (included in Appendix C of the Draft SEIS). Section 3404 of the Act called for the transfer of all 56,000 acres of the Naval Oil Shale Reserves (NOSR) near Rifle, Colorado from the Department of Energy (DOE) to the Department of the Interior (DOI), to be managed by the BLM, and mandated that the oil and gas reserves of the developed portion of the NOSR be offered for lease by November 18, 1998. Because of the area's proximity and a physical nature similar to surrounding BLM land, the GSRA decided to include the developed portion of the NOSR in the SEIS. This decision was published in the Federal Register on March 17, 1998. The Draft SEIS was released for public review on June 19, 1998. The period for commenting on the Draft SEIS ended on November 23, 1998.

This is the Final SEIS on Oil and Gas Leasing in the GSRA of the BLM. The leasing decisions in this SEIS constitute an amendment to the RMP which will supersede all previous oil and gas leasing decisions.

The SEIS addresses the entire GSRA (568,000 acres of public land from Edwards to DeBeque and from Aspen to Toponas, Map 1-1), but most of the analysis will focus on the area with the highest potential for oil and gas development, referred to as Region 4 in the SEIS. Outside Region 4, only one well (oil) has been drilled since the FEIS was prepared, and there are currently no producing oil and gas wells.

1.2 Purpose and Need

When the 1991 FEIS was being prepared, only limited oil and gas development had occurred in the GSRA. In the previous 30 years, about 80 wells had been drilled on federal mineral estate. The Reasonable Foreseeable Development (RFD) scenario used in the FEIS forecast 90 wells for the entire GSRA, which seemed a likely level of development for the next 20 years. However, soon after completion of the FEIS, the level of development activity began to increase in the high potential area of the GSRA described as Region 4 (Map 1-2). Although 72 wells had been anticipated for Region 4 over a 20 year period, that number was reached in only eight years. This higher-than-expected rate of development raised questions about the impact analysis in the FEIS and its continued validity.

The FEIS (page 1-6) stated that when the number of wells identified in its RFD scenario had been authorized, BLM would prepare an environmental analysis to determine if the impacts identified in the FEIS had been exceeded. BLM concluded that development was concentrated in a relatively small area along the Interstate 70 corridor from Silt to Parachute in a pattern that was denser than implied in the FEIS. Additionally, as many as 25 wells per year had been approved on public land in recent years, and such rates are expected to continue into the future. This exceeds the rate analyzed in the FEIS. Therefore, a decision was made to complete a new evaluation of the impacts of oil and gas leasing and development in the GSRA and the SEIS process was initiated.

The purpose of the SEIS is to: 1) comply with the FEIS mandate for a review of environmental effects when the number of wells exceeded the RFD; 2) provide public disclosure of the impacts of a level of development greater than originally anticipated; 3) provide an improved information base for managing gas development impacts; 4) prepare a set of management objectives or standard operating procedures that could be used to manage future oil and gas development; and 5) review and modify the lease stipulations that could be applied to future leases and thereby amend the RMP for the GSRA.

An SEIS is a document prepared to supplement an EIS when more environmental analysis is needed, generally because of new circumstances or the availability of new information relevant to environmental impacts, or when substantial changes to the original proposed action are being considered. This SEIS will provide additional environmental analysis and will modify the FEIS. However, some portions of the FEIS will not require addition or modification. The FEIS is hereby incorporated by reference and all information included in that document, unless modified or replaced by this SEIS, remains unchanged.

The overall objective for the SEIS is the same as the objective in the FEIS: to facilitate orderly, economic, and environmentally sound exploration and development of oil and gas resources using balanced multiple-use management (Record of Decision, page 11). BLM is not proposing changes to the major decisions in the FEIS, namely that: 1) the entire federal mineral estate in the GSRA, except the Wilderness Study Areas (WSAs), would be open for oil and gas leasing and development; 2) BLM would apply lease stipulations and lease notices as appropriate to all new leases; and 3) BLM will develop appropriate Conditions of Approval (COAs) for all Applications for Permit to Drill (APDs) for leases issued prior to the FEIS, provided the COAs are consistent with lease rights granted.

Although the lease stipulations and conditions of approval described in the SEIS were developed to apply to oil and gas leasing and development, it is intended that the same or similar measures will be applied to other public land uses in order to maintain or achieve the same resource conditions and to assure equitable treatment to all public land users. Additional administrative procedures may be needed to determine how best to apply comparable measures to other uses.

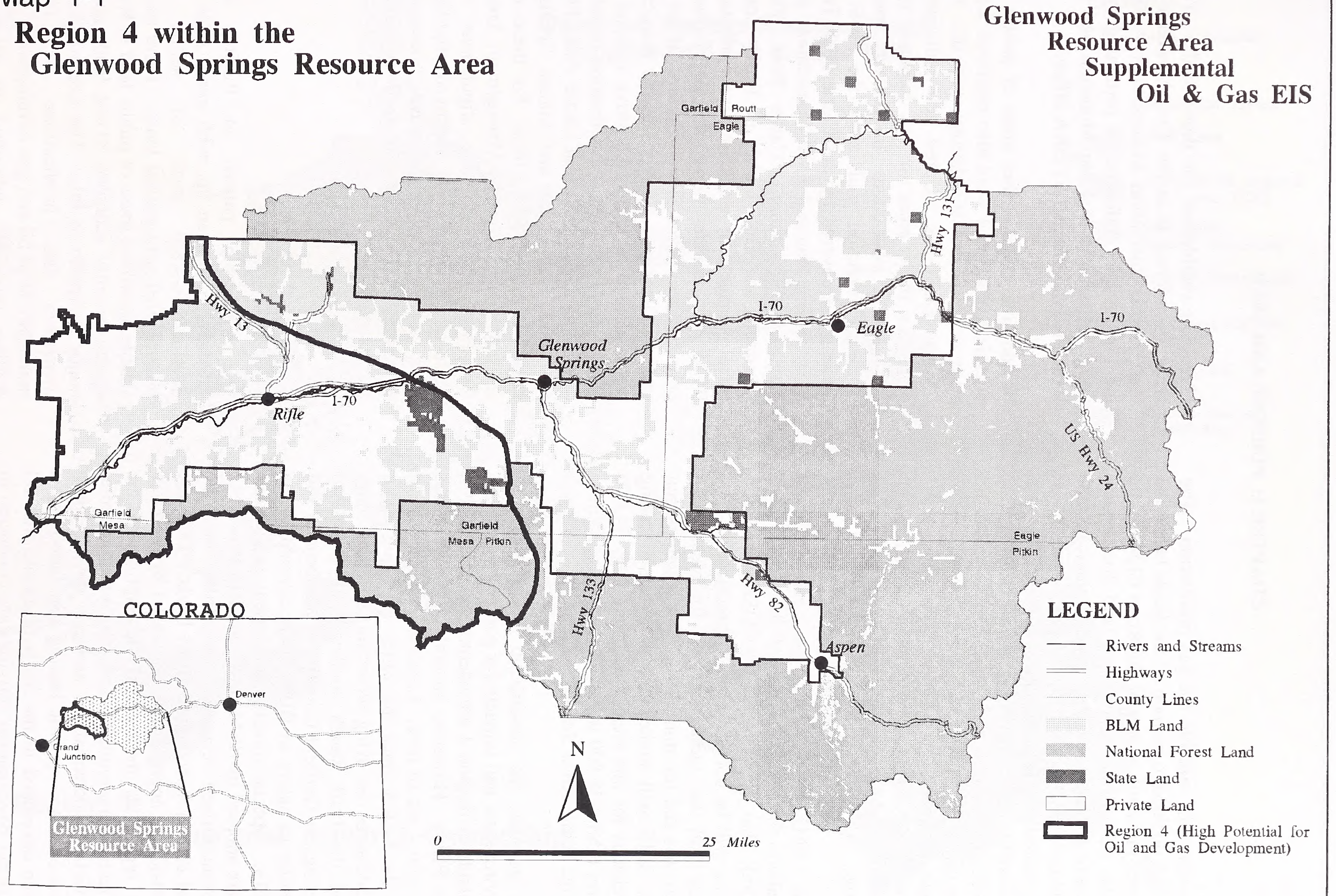
1.3 Location

The FEIS included the entire GSRA in its evaluation of impacts, as well as four other Colorado BLM resource areas. This SEIS will also include the entire resource area (568,000 acres of public land from Edwards to DeBeque and from Aspen to Toponas), but most of the analysis will focus on Region 4 since almost no development has occurred outside Region 4 and that pattern is expected to continue into the future. Only one well (oil) has been drilled outside Region 4 in the years since the FEIS was prepared.

Within Region 4, the NOSR Production Area (see Map 1-3) will be singled out for special reference. Though the NOSR had not been open to oil and gas leasing, DOE drilled and operates 30 wells and is partners with private oil and gas operators on an additional 28 wells, affecting approximately 7,700 "developed" acres. The purpose of this development was to offset gas production on adjacent property, protecting the U.S. Government's interest in the gas reserves. These lands contain roads, wellpads and pipelines. The area referenced on Map 1-3 as the NOSR Production Area actually contains more than the 7,700 acres that DOE considered

Map 1-1

Region 4 within the Glenwood Springs Resource Area



economically suitable for gas production. The GSRA decided to include all the lands below the rim of the south aspect of the Roan Cliffs in the SEIS study area, since this land form more closely approximates an entire ecological unit. Additionally, lease boundaries must be delineated in a logical manner that establishes a reasonable lease area with enough potential for profit that the area will be of interest to oil and gas operators. It is anticipated that the logical lease boundaries might include some lands outside the currently developed tract. The designated NOSR Production Area is 12,029 acres.

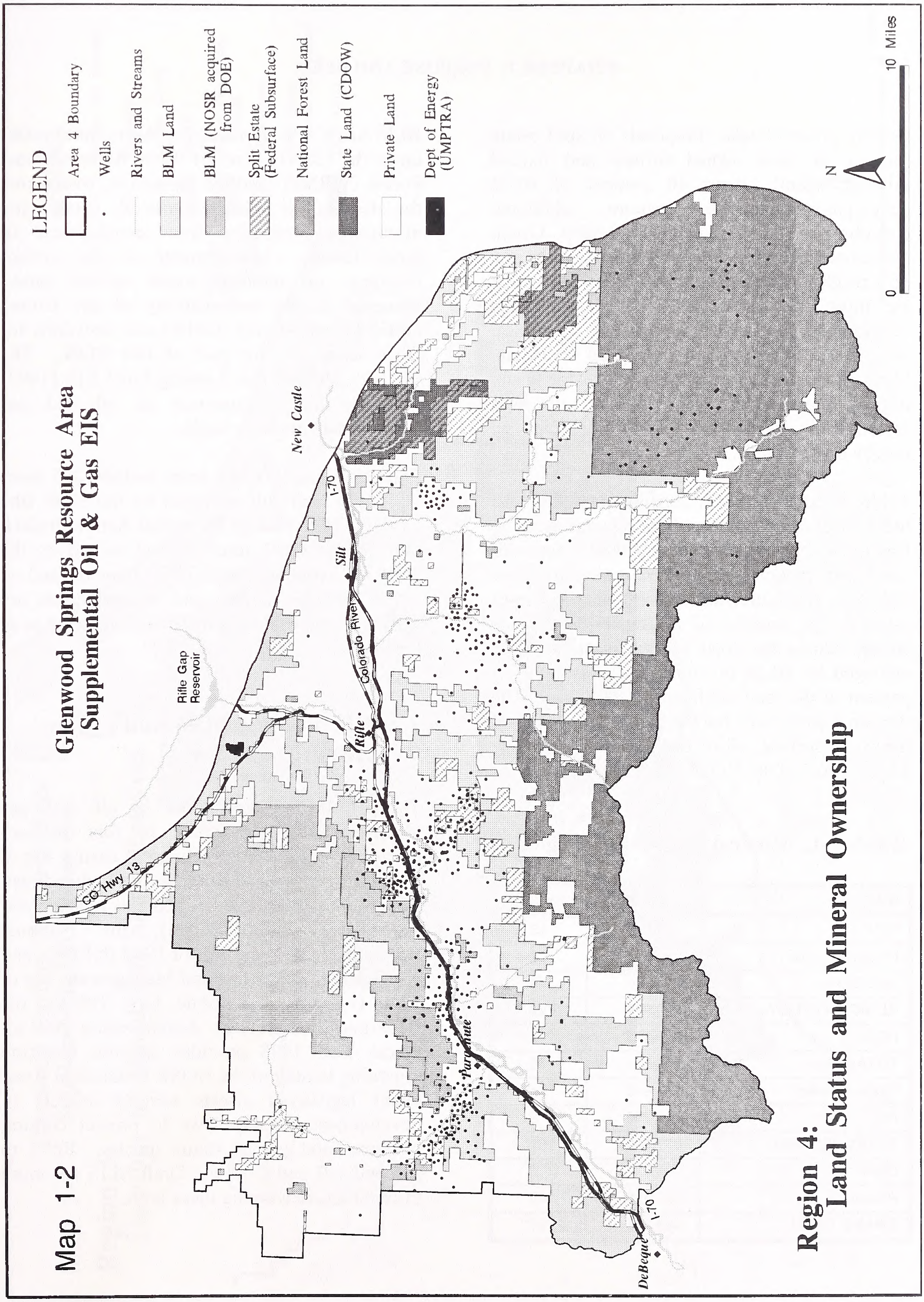
The RMP amendment and environmental analysis for the remainder of the 56,000 acre NOSR, that part north of the NOSR Production Area, will be done as soon as practicable. The area will be included here for descriptive purposes and for many acreage calculations, but the SEIS will make no oil and gas leasing decisions for this area of approximately 44,000 acres (about 38,000 in the GSRA, the remainder in the White River Resource Area).

In general, the description of the existing environment and impacts for parts of the GSRA outside of Region 4 are adequately described in the FEIS. However, several changes outside Region 4 are of note. Lands acquired by BLM in the GSRA since the FEIS, including about 4,200 acres near King Mountain in Routt County and the Haff Ranch southeast of Glenwood Springs in Garfield County are adjacent to and similar in nature to BLM lands covered in the FEIS. Special travel management restrictions were adopted by BLM since the FEIS to achieve non-motorized recreation objectives on these and certain surrounding BLM lands. They are considered appropriately addressed by the FEIS in regard to the general description of the affected environment and the environmental effects of potential oil and gas development. However, site specific leasing stipulations have been developed in the SEIS to ensure that oil and gas development activities are conducted in a manner consistent with the travel management objectives established for those lands. These areas are referred to as the King Mountain and Haff Ranch Recreation Management Areas in the Final SEIS. Information pertaining to the travel restrictions on King Mountain and Haff Ranch is available at the GSRA office.

In addition, several other areas of public land outside of Region 4 were also reviewed for the adequacy of the stipulations per the FEIS because BLM has adopted new management plans for these areas or has imposed travel management restrictions to achieve specific resource protection goals since the FEIS. In those areas covered by the Castle Peak Travel Management Plan and RMP Amendment, dated August, 1997, namely Castle Peak, Pisgah Mountain and Bull Gulch in Eagle County, travel management restrictions were adopted by BLM to provide non-motorized recreation opportunities. Near Siloam Springs, at the east end of Glenwood Canyon, travel restrictions were adopted to protect sensitive cultural and other natural resources. Information pertaining to the travel restrictions on Castle Peak, Pisgah Mountain, Bull Gulch and Siloam Springs is available at the GSRA office. For these areas, referred to as Recreation Management Areas in the Final SEIS, leasing stipulations were evaluated to ensure the approved stipulations were consistent with the travel management objectives and resource protection goals for those areas.

1.4 Land Status

The ownership pattern in Region 4 is substantially broken up, with many small and intermediate-sized tracts of public land intermingled with private lands. There are few sizable, unbroken tracts of public land in Region 4; the recently acquired NOSR lands are the major exception to this. The intermingling of ownership has implications for BLM's management of oil and gas development. Many drilling proposals submitted to BLM also involve concurrent development on adjacent or



Map 1-2

Glenwood Springs Resource Area Supplemental Oil & Gas EIS

Region 4: Land Status and Mineral Ownership nearby private lands. Proposals on split estate (private or state owned surface and federal mineral estate), about 40 percent of BLM development activity, require additional consultation with the surface owner. Often, immediately adjacent private property is the site of a residence which may lead to concerns that are most often associated with oil and gas development on private lands - smells, noise, dust, traffic, effect on domestic water wells, etc. Mitigation efforts, particularly, those for visual impact, may in fact depend on, or have their effectiveness influenced by, developments on nearby private lands.

Table 1-1, Mineral Ownership, describes the breakdown of ownership of the mineral estate in Region 4. BLM manages 100,545 acres of combined federal surface and mineral estate (BLM in the table) and 50,500 acres of split estate. The transfer of responsibility for the NOSR brings the total federal mineral estate managed by BLM to 200,937 acres, about 35 percent of the total land area in Region 4. The Region 4 study area for the SEIS includes all of the BLM surface, all of the split estate and the 12,029 acres of the NOSR Production Area.

Table 1-1. Mineral Ownership, Region 4

Status	Acres	Percent
BLM	100,545	18
Production Area	12,029	2
Split Estate	50,500	9
REGION 4 STUDY AREA	**163,074**	**29**
NOSR	37,863	7
TOTAL BLM	**200,937**	**35**
National Forest	136,418	24
DOE	205	0
TOTAL FEDERAL	**337,560**	**59**
State	3,512	1
Private	227,476	40
GRAND TOTAL	**568,548**	**100**

BLM has a role in managing the mineral estate under the 136,418 acres of White River National Forest (WRNF) lands in Region 4, overseeing the leasing of federal mineral estate and monitoring production from development of those leases. Management of the surface resources on national forest system lands, however, is the responsibility of the United States Forest Service (USFS) and decisions for those lands are not part of this SEIS. The WRNF's Oil and Gas Leasing Final EIS (1993) describes the management of oil and gas development on those lands

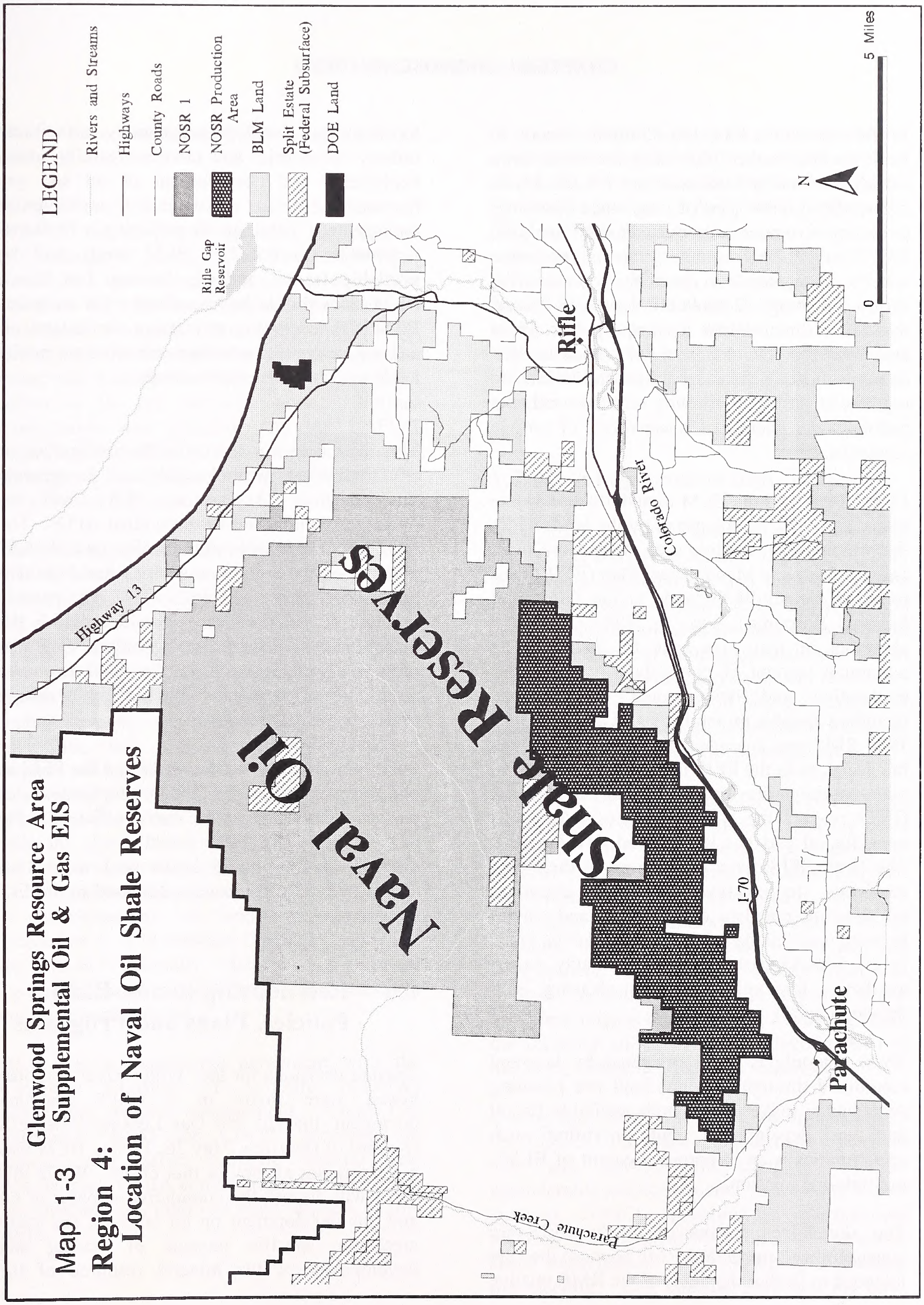
The remaining 231,193 acres include 205 acres of federal land still managed by the DOE (the Uranium Mill Tailings Remedial Action Project, UMTRAP), 3,512 acres of land owned by the State of Colorado, and 227,476 acres of land on which both the surface and mineral estate are privately held. These last are often referred to as fee lands.

1.5 BLM Authorities and Responsibilities

The BLM's responsibilities in oil and gas management are described in four primary pieces of legislation: the Mineral Leasing Act of 1920 (MLA), as amended; the 1987 amendment to the Federal Onshore Oil and Gas Leasing and Reform Act (FOOGLRA); the National Environmental Policy Act of 1969 (NEPA); and the Federal Land Policy and Management Act of 1976 (FLPMA). Public Law 105-85, the Department of Defense Authorization Act for Fiscal Year 1998 provides specific direction regarding leasing of the NOSR Production Area. Other legislation affects various aspects of development, notably laws to protect cultural resources and special status species. Refer to Appendix B and C of the Draft SEIS for more information concerning these laws.

Map 1-3 Glenwood Springs Resource Area Supplemental Oil & Gas EIS

Region 4: Location of Naval Oil Shale Reserves



While only Public Law 105-85 refers directly to lands covered in the Draft SEIS, the above laws establish a multiple-use mandate for the BLM, incorporating principles of long range planning, public involvement and environmental analysis. NEPA and FLPMA generally do not prescribe specific outcomes but establish processes for decision-making. Both Public Law 105-85 and the MLA direct BLM to make public lands available for development of oil and gas resources. FOOGLRA requires the BLM to regulate all surface disturbing activities and take actions in the interest of conservation of surface resources.

FLPMA requires the BLM to undertake land use plans to provide for the use of public lands under the principles of multiple use. A land use plan, called a Resource Management Plan (RMP), was prepared for all BLM lands in the Glenwood Springs Resource Area in 1984; a stated objective in that plan was to maintain the maximum amount of public land available for exploration and development of minerals, including leasable minerals like oil and gas. The 1984 RMP was amended in 1991 by the FEIS; the decisions in the FEIS included a provision to maintain the entire federal mineral estate in the GSRA, except the Wilderness Study Areas, as open for oil and gas leasing and development. The Draft SEIS, as a supplement to the FEIS, continues to acknowledge the important multiple-use mandate of the BLM and carries forward previous decisions to make public lands in the GSRA, except Wilderness Study Areas, available for oil and gas leasing and development.

Thus, not only is BLM obligated by law and committed through previous land use planning decisions to make public lands available for oil and gas development, but providing such opportunities is an important element of BLM's multiple-use mission.

The alternatives considered in the SEIS are consistent with the GSRA RMP because they are intended to further the goals of the RMP relative to oil and gas development, namely to facilitate orderly, economic, and environmentally sound exploration and development of oil and gas resources using balanced multiple-use management. At issue in preparing a Preferred Alternative is not "if" BLM lands will be available for oil and gas leasing, but "how" BLM lands should be leased and what measures BLM should employ to manage the federal oil and gas resources and other resources on public lands using multiple-use concepts.

This SEIS does not authorize the construction of any individual well locations. A separate Environmental Assessment (EA) will be prepared in the future for individual APDs. The EAs for APDs are site-specific and include inventories for cultural resources and sensitive plant and animal species. The EA process involves an on-site exam in which BLM, the operator and interested stakeholders view the proposed well location in the field to make appropriate adjustments to the location or design of the wellpad and road.

Future EAs will tier to this SEIS and the FEIS as much as possible to avoid duplication of paperwork and make for more efficient APD processing. The EAs would focus on site-specific, on-the-ground issues and would not address those larger issues addressed in the EIS documents.

1.6 Relationship to non-BLM Policies, Plans and Programs

Leasing decisions for the White River National Forest were made in a USFS planning document, the Oil and Gas Leasing Final EIS (Record of Decision, May 26, 1993). BLM was a cooperating agency in that effort. While this SEIS will discuss the cumulative impacts of oil and gas development on all lands in the study area, the specific impacts of leasing and development of the mineral resource of the

White River National Forest will not be analyzed.

BLM is coordinating with the U.S. Fish and Wildlife Service (USFWS) under the terms of the Endangered Species Act. The USFWS has determined that consultation is not required at this time for any listed species other than the endangered Colorado River fishes. BLM has determined the average annual water depletion associated with the development of oil and gas resources in the resource area. Formal consultation was initiated with the USFWS regarding the effect of this depletion on the endangered fish. Please refer to Appendix G for consultation information.

BLM has a memorandum of understanding with the Colorado Oil and Gas Conservation Commission (COGCC) and a long-standing, day-to-day working relationship with the COGCC staff. The working relationship consists of regular communication related to the technical requirements for drilling wells. These include spacing of wells, draining oil and gas reservoirs, and analysis and mitigation of impacts on groundwater. The basis of the relationship is COGCC's authority over oil and gas operations in the State of Colorado.

BLM also works cooperatively with the Garfield County government on issues of mutual concern. A memorandum of understanding, dated December 4, 1978 between Garfield County and the BLM, generally describes a mutual agreement to inform and involve each entity in certain planning issues.

BLM has a cooperative agreement with the Colorado Division of Wildlife (CDOW) concerning wildlife management. Under this agreement, BLM and CDOW cooperate on actions that affect wildlife habitat and populations. GSRA consultation with CDOW is ongoing and has involved many aspects of this SEIS.

In cases of split estate, BLM leases federal minerals that lie beneath private surface. The private landowner is notified when the minerals are leased and when an Application for Permit to Drill (APD) is filed. The landowner is invited to attend the on-site inspection and his needs and desires are considered in development of the lease. BLM has the same authority to require mitigation on private surface as it does on federal lands. This ensures the private land owners of protection when the federal minerals are extracted.

1.7 Scoping Process and Issues

As a result of current and anticipated levels of oil and gas activity in Region 4, BLM, CDOW, landowners, communities and individuals have identified concerns relative to the impacts of oil and gas development activities, especially on wildlife and natural habitats, groundwater, visual resources, transportation systems and residential areas. Public interest in oil and gas issues has increased dramatically as development activities have begun to encroach on residential areas.

The formal scoping process for this SEIS began with a Federal Register notice on April 21, 1997, at which time a statement was released to western Colorado news media. Additionally, an informational package was mailed to about 250 individuals and organizations, most of them residents of the area affected by oil and gas development. The response to this effort was limited. A follow-up Federal Register notice and press release on March 17, 1998, regarding the inclusion of the NOSR Production Area in the SEIS, also generated little response.

During the summer of 1997, an application to the COGCC for higher well density by an oil and gas development company led to considerable public concern. In response to this concern, COGCC sponsored an informational meeting in Battlement Mesa on July 9 in which BLM participated. Over 300 people attended the meeting. This episode generated the most direct response to BLM on issues related to oil and gas development. Since then, the COGCC and BLM have both engaged the citizens of the area in a number of ways. Two organizations have been consulted a number of times on development issues: the Battlement Mesa Service Association (BMSA) and the Grand Valley Citizen Alliance (GVCA). The BMSA is the oversight body of the unincorporated community of Battlement Mesa; the GVCA is a group formed to address concerns about oil and gas development throughout Garfield County. On February 19, 1998, the COGCC held a forum on its proposed new regulation for incorporating citizen concerns into its spacing decisions, which generated a substantial response.

The following issues have been distilled from the many comments and general interaction described above. The Draft SEIS evaluated the affected environment and environmental consequences of oil and gas leasing decisions on these issues. The Draft SEIS was released for public comment on July 19, 1998 and closed on November 23, 1998. Chapter 5 contains a summary of comments and responses. Many of the comments received are reproduced in a companion document available from the GSRA upon request.

Lease Rights. Most of the high potential gas production area in the GSRA, Region 4, is already held by oil and gas leases which were issued prior to the completion of the FEIS. BLM can restrict operations under existing leases as long as such restrictions are consistent with the lease rights granted. The FEIS states that decisions would be implemented for new operations on existing leases as COAs, where it would not adversely affect rights already granted.

However, the ability of BLM to require certain COAs on permits is constrained and some of the mitigation approved in the FEIS has been unavailable to BLM, except in situations where the operator would voluntarily agree to such measures. See Section 2.3 for a discussion of lease rights.

Reclamation. The success of BLM's efforts to reclaim lands disturbed for gas production has been questioned. Inadequate reclamation may lead to soil erosion, invasion of noxious weeds, loss of wildlife and livestock forage, and visual impacts. Reclamation in semi-arid environments is a very slow process, leading to public perceptions that BLM has required too little of the operator in this regard. See Appendix I of the Draft SEIS for a description of the GSRA policy on reclamation and a review of reclamation to date.

Riparian Community. Riparian zones include some of the most productive and valuable vegetation communities in Region 4; at the same time, topography sometimes dictates that potential well sites and roads be placed directly in or adjacent to these areas. How extensively have riparian zones been affected and how can they be better protected? Sections 3.3.1 and 4.3.1 describe the riparian resource and how it is impacted by oil and gas development.

Wildlife. Deer and elk are affected by loss of forage, loss of habitat and disturbance from human activities, especially at critical times. Construction of roads and wellpads removes vegetation used as forage and browse, altering the structure, and thus the utility, of habitat. The same disturbances and intrusive activities affect other species: raptors, bats, and neotropical birds. Refer to Sections 3.5 and 4.5.

Soils. Any activity that removes surface cover and reshapes the landform may well increase soil erosion. Erosion is even more likely to increase when the disturbance occurs in steep and erosion-prone soils, as is sometimes the case in Region 4. The topography in Region 4 often forces a choice between impacting the riparian zone or an erosive, steep hillside adjacent to the riparian zone. Refer to Sections 3.8 and 4.8.

Visual. The surface disturbance caused by gas drilling alters the natural landform so that the visual character is affected. The production facilities left on the completed wellpad also alter the landscape character. Much of the development occurs in the I-70 corridor and hence is visible to many visitors and travelers. Residents of the area often view the disturbance from their homes. Refer to Sections 3.12 and 4.12.

Transportation Systems. Developing natural gas involves a network of roads and pipelines to access the wellpads and transport the gas. The roads affect wildlife habitat, create new access for recreation use and alter the visual character of the area. Well drilling rigs and support equipment travel from site to site and may affect local traffic patterns, damage roads, and create safety issues. In addition to sections on wildlife and visual resources, see Sections 3.17 and 4.17.

Socioeconomic. Gas drilling is an economic activity that brings jobs, creates income and revenue, and requires expenditures for building and maintaining infrastructure. These impacts on local economies are generally considered positive; however, the degree of activity may affect the residential character of the area. Refer to Sections 3.18 and 4.18 and Appenidx F.

Air Quality. Dust and exhaust from construction and maintenance activities, along with materials discharged from the wellhead in venting and flaring activities, have been identified as possible causes of unacceptable decreases in air quality. These issues are more likely to generate public concern when oil and gas activities encroach on residential areas. Refer to Sections 3.1 and 4.1.

Groundwater. In September, 1997, an underground blowout occurred which resulted in natural gas and drilling fluids migrating into a domestic water well approximately one mile away. The underground blowout was contained by pumping drilling mud and cement to shut off the gas flow. A replacement well for the water showed elevated benzene and methane levels. There are concerns that such problems would develop again on other wells. Refer to Sections 3.9.2 and 4.9.2.

Project Rulison. On September 10, 1969, a 43 kiloton nuclear device was detonated six miles southeast of Parachute, Colorado to fracture rock and release gas in a gas-bearing formation 8,426 feet below the surface. The associated wells were plugged and abandoned in September, 1976. Monitoring and testing for radioactive materials has been conducted on a regular basis ever since. In August, 1997, DOE tested five gas wells within three to five miles of the project, and found no indications of radioactive contamination. However, the public is concerned about possible radioactive contamination from Project Rulison and questions whether oil and gas development in the vicinity of the project should be permitted regardless of monitoring and testing results to date. See Appendix E for more information on Project Rulison.

Quality of Life. Public lands contribute to the quality of life of residents. The impact to the quality of life of residents in the proximity of oil and gas development activities and the degree to which oil and gas development is or is not compatible with residential development is dependent on the perspective of the resident. Since quality of life is more a matter of personal perspective than a definitive outcome which BLM can directly affect, BLM will not attempt to quantify quality of life issues nor prescribe a desired outcome. Rather, BLM will focus the SEIS more on the specific factors which might affect quality of life, such as wildlife, recreation, air and water qualty, and scenic viewsheds.

Chapter Two

THE PREFERRED ALTERNATIVE

2.1 Introduction

Three alternatives were evaluated in the Draft SEIS. They were the Continuation of Current Management Alternative, the Maximum Protection Alternative and the Proposed Action. Based on public comments received during the comment period for the Draft SEIS, and upon further staff review of the alternatives, a final Preferred Alternative was developed.

This chapter discusses the tools that BLM uses to manage oil and gas development, emphasizing the ongoing authority and responsibility of BLM and the additional, specialized authority provided by lease stipulations. The Preferred Alternative is then presented and compared to the three alternatives considered in the Draft SEIS. This is followed by a discussion of the rationale for the Preferred Alternative. Due to the number of public comments on the Draft SEIS regarding the effect of existing leases on BLM's ability to achieve the management goals and objectives described in the Draft SEIS, the chapter concludes with a description of BLM's protocol for managing development on existing leases.

2.2 BLM Tools for Managing Oil and Gas Development

Each of the alternatives included in the SEIS is characterized by a series of mitigation measures designed to accomplish various levels of resource protection. These mitigation measures can be grouped into several categories and are the primary tools used by BLM to affect oil and gas operations. They are:

- The standard terms and conditions of an oil and gas lease (see Appendix D of the Draft SEIS for a description of standard lease terms);
- Lease stipulations, including No Surface Occupancy (NSO), Timing Limitation (TL) and Controlled Surface Use (CSU), which are developed in the BLM planning process and may be attached to a lease;
- Conditions of Approval (COA), which are applied to a permit to drill at the time of actual lease development;
- Lease Notices, which are attached to the lease and alert lessees to the need for inventories or other special requirements.

The stipulations described in each alternative should be viewed in the context of BLM's overall authority and responsibility for the management of surface resources on public lands. Independent of any stipulations attached to an oil and gas lease, BLM has broad authority and responsibility for the multiple-use management of public lands under the Federal Land Policy and Management Act of 1976 (FLPMA) and for protection of specific resources, under such laws as the Endangered Species Act and the Historical Preservation Act. This general mandate provides authority for extensive regulation of oil and gas development activities.

2.2.1 Standard Lease Terms and Conditions of Approval

All public land oil and gas leases have standard terms and conditions. These terms and conditions apply to all oil and gas operations on federal mineral estate, regardless of when the lease was issued and apply to all alternatives considered in the SEIS.

The clearest expression of BLM's authority for managing the surface impacts of oil and gas development is found in Section 6 of the standard lease terms. Section 6 requires the oil and gas lessee to "conduct operations in a manner that minimizes adverse impacts to the land, air, and water; to cultural, biological, visual and other resources; and to other land uses or users." In pursuit of this objective, the lessee must take measures deemed necessary by the BLM to minimize adverse impacts. Such measures may include, but are not limited to, "modification to siting or design of facilities, timing of operations, and specification of interim and final reclamation measures." Elsewhere, this authority is limited by the requirements that BLM not move the proposed operation more than 200 meters, not relocate the operations off the leasehold, and not prohibit operations for a period in excess of 60 days (43 CFR 3101.1-2).

When the lessee submits an Application for Permit to Drill (APD), the plan of operations included in the APD may already include some measures to minimize adverse impacts. To the extent that additional mitigative or protective measures are needed, BLM may place Conditions of Approval (COAs) on the APD. Integral to the process of evaluating and mitigating potential adverse impacts is an on-site inspection by BLM personnel and the preparation of an Environmental Assessment (EA). Typically, the final plan for a well may have involved one or more surveys for cultural resource values, paleontological values or threatened or endangered species habitat, the relocation of the wellpad or road to avoid unnecessary impacts, special site design features to improve the potential for reclamation success, and implementation of a variety of measures aimed at health and safety. Essentially, COAs are used to describe *how* oil and gas will be developed to reduce surface impacts while facilitating oil and gas development. COAs are not voluntary and the operator is expected to comply with these measure as a condition of the approval for the affected well(s).

BLM develops COAs on a case-by-case basis to address site-specific issues. Any mitigation measure which is consistent with lease rights, or accepted on a voluntary basis, and the guidance set forth in this plan and subsequent amendments is available to the Authorized Officer (AO) for use as a COA. For example, the Wildlife and Wildlife Habitat Lease Notice in the Preferred Alternative requires the operator to develop and implement specific measures to address the impacts of their operations on wildlife and wildlife habitat. Any measure, such as the use of radio telemetry, to satisfy terms of this lease notice would be applied to the APD as a COA, or included in the operator's plan of operations.

The list of COAs that have been applied to oil and gas development in Region 4 is too extensive to detail here, but a sampling of such COAs includes: painting of facilities to reduce the visual impact, closing of roads to limit access, storage of topsoil to enhance reclamation, the use of pit liners, co-location of pipelines in roads, fencing of the wellpad during reclamation, installation of sediment traps, and monitoring of wells within three miles of Project Rulison. Appendix D of the FEIS contains a full listing of potential COAs in use in 1991. Appendix D of this document includes COAs developed since then. It is important to note that COAs can be developed and implemented by the AO as needed without preparing an EIS or an RMP amendment. They are available to the AO as part of BLM's general regulatory authority over oil and gas development and, at most, require only an EA to demonstrate their need.

2.2.2 Lease Stipulations

Oil and gas leases grant the lessee the right to extract the oil and gas resource. Section 6 of the standard lease terms restricts the lease rights granted by requiring protection of other resources during development of the oil and gas. However, in those instances where BLM's regulatory authority provided by Section 6 is considered to be insufficient, such as in areas with very high wildlife, riparian, or visual values, or in areas with extremely sensitive resources which warrant special attention during operations, BLM uses lease stipulations to provide additional regulatory authority. Lease stipulations are additional terms and conditions placed on an oil and gas lease that have application to a specifically identified area or resource. They are developed through an RMP amendment to address those situations where BLM's general regulatory authority may be insufficient and, occasionally, to make very clear the limitations under which a lessee may have to operate in a certain area.

Lease stipulations are usually developed through an RMP planning process which provides for a larger, more regional overview of oil and gas leasing issues. The leasing stipulations are intended to define the general constraints or sideboards of future development, and are not expected to address on-the-ground issues, or prescribe all the specific protective measures that might later be determined to be necessary. The distinction between BLM's general regulatory authority and the additional authority provided by a lease stipulation is illustrated by the need to limit operations on big game winter range during the winter. Without the benefit of a lease stipulation, BLM may prohibit operation on deer winter range for 60 days. However, in some areas such as Region 4, deer may make use of winter range for periods longer than 60 days. In such a case, a lease stipulation would define the period of potential use by deer - December 1 through April 30 in Region 4 - and BLM would have the authority to *require* that no operations take place during that time. If such a stipulation were not attached to the lease, BLM could only prohibit operations for 60 days.

The importance of the lease stipulation in expressing BLM's management objectives is often overlooked, even in cases where the stipulation is not attached to the lease. In the case of deer winter range, the lease stipulation identifies the area that requires protection, establishes BLM's intent to protect the area, and validates measures short of prohibiting drilling to protect the area, such as requesting voluntary compliance, limiting the hours of most intense traffic, or installing gates to minimize public access.

Lease stipulations come in three forms: No Surface Occupancy (NSO) stipulations, Timing Limitation (TL) stipulations, and Controlled Surface Use (CSU) stipulations. ***NSOs*** are the strongest form of stipulation, prohibiting any surface disturbance in an area to protect a specific resource value. Lease holders may develop the fluid mineral resource in such areas by directional drilling, that is, by placing the wellpad outside the NSO area and drilling at an angle to the target resource. In many cases, the NSO is written with exceptions that would allow surface disturbing activities if conditions which would protect the resource in question were met. An example in Region 4 involves the watershed for the town of Rifle's domestic water supply. The federal mineral estate in that watershed is protected by an NSO. Exceptions to the NSO permit development if such development can be done in a way that the town of Rifle agrees that its water quality is assured. A plan for meeting the exception criteria is currently being developed. The critical element of the watershed NSO is that BLM can deny APDs in the NSO area until the exception criteria have been satisfied.

TLs are seasonal protections that prohibit activity for more than 60 days during a certain part of the year. The example above of the big game winter range TL illustrates the operation of such a stipulation. Most such stipulations are for the seasonal protection of wildlife habitat during critical times of the year. A timing limitation stipulation is not necessary if it involves the prohibition of surface disturbing operations for periods of less than 60 days, in which case the standard terms and conditions would suffice to limit the activity.

CSUs are developed for areas where surface disturbance may be permitted, but it is thought that the special site design or implementation features that may be required to protect the resource in question may exceed BLM's general regulatory authority. Some CSUs call for relocation of the proposed well site beyond 200 meters if the design and implementation features are not sufficient to satisfy the purpose of the CSU. Under the lease stipulations developed in the FEIS, fragile soil areas and slopes over 40 percent are both protected by CSUs. These stipulations are in place to assure that the leaseholder is aware of what may be considered exceptional engineering requirements to assure site stability and reclamation success in areas that may be particularly unstable.

Stipulations are applied by legal description to oil and gas leases on the basis of standard quarter-quarter sections (40 acres) or lots. Any lease parcel, containing at least a quarter-quarter section or lot, and needing mitigation will have the appropriate stipulation appended to the lease document. However, the lease stipulation, though described for the entire 40 acre parcel or lot, would only apply to the resource as located on the ground. For example, the Anvil Point Cave NSO in the Preferred Alternative will be described with several 40 acre parcels, but will only apply to the 20 acre watershed above the cave area. Actions proposed within the 40 acre parcel(s), but outside the watershed area, would not be affected by the NSO.

Most stipulations are subject to exception, modification or waiver under certain conditions. Generally, an exception, modification or waiver may be approved if the record shows that circumstances or relative resource values have changed, or if the lessee can demonstrate that operations can be conducted without causing unacceptable impacts, and that less restrictive measures will protect the public interest. Waivers, exceptions, or modifications can only be granted by the AO. If the proposed waiver, exception, or modification is inconsistent with the RMP, the plan must be amended to accommodate the change. Even where exceptions are not identified, they may be considered on a case-by-case basis.

Lease Notices are attached to leases to transmit information when the lease is issued. This assists the lessee in submitting acceptable plans of operation, or assists in lease administration. Lease Notices are attached to leases in the same manner as stipulations; however, there is an important distinction between Lease Notices and stipulations. Lease Notices do not involve new restrictions or requirements. Any requirements contained in a Lease Notice must be fully supported by law, regulations, standard lease terms, or onshore oil and gas orders. Guidance in the use of Lease Notices is found in BLM Manual 3101 and CFR 3101.1-3.

If a situation or condition is known to exist that could affect lease operations, there should be full disclosure at the time of lease issuance via a Lease Notice. If a lessee may be prevented from extracting oil and gas through a prohibition mandated by a specific non-discretionary statute, such as the Endangered Species Act, a stipulation may be used even though a Lease Notice would be sufficient. The AO has the discretion to determine whether a situation is sufficiently sensitive to warrant the use of a lease stipulation.

2.3 Lease Rights

Since about 95 percent of Region 4 is already leased, lease rights considerations are an important element of oil and gas management. The lease stipulations described in the FEIS as well as the SEIS can only be enforced on existing leases if such measures are consistent with lease rights already granted. This issue received numerous comments during review of the Draft SEIS, so information is provided here to supplement material contained in the Draft SEIS, Appendix B, Oil and Gas Leasing and Permitting.

An oil and gas lease is essentially a contract between the BLM and the lease holder. The BLM transfers to the lease holder the right to explore and develop all the oil and gas resources, subject to the stipulations attached to the lease. After issuing the lease, BLM is then obligated to honor the lease rights granted.

BLM is equally obligated to require measures of the operator to protect the land and other resources. Section 6 of the standard lease terms and conditions provides broad authority for BLM to manage oil and gas activities. It is only in special situations where such authority is not adequate and therefore, lease rights only become an issue on existing leases when such special situations develop. For example, protecting big game winter habitat by prohibiting operations for more than 60 days becomes an issue on leases without a specific timing limitation. Much of BLM's management of oil and gas development never involves the enforcement of a lease stipulation. For example, the surveys frequently required before construction of the wellpad, the siting of the pad, design of the road, color and placement of facilities, and all matters related to reclamation are management elements that rely simply on BLM's general management authority under FLPMA and not on lease stipulations. Refer to Chapter 2, Section 2.2.1 for more information on the operation of standard lease terms.

However, BLM cannot restrict operations under a lease, even if subsequent planning operations direct the application of certain operating conditions, if such conditions are not consistent with lease rights granted. Federal regulations (43 CFR 3101.1-2) have established the "200 meter/60-day rule" and provide that relocations of proposed operations up to 200 meters, or timing limitation up to 60 days are consistent with the granted lease rights. Thus, any requirement that does not involve moving a location more than 200 meters or restricts operations of more than 60 days, will likely be considered consistent with lease rights provided the restriction is clearly and convincingly documented. BLM Instruction Memorandum 92-67 provides guidance regarding the application of the *200 meter/60-day rule* and establishes additional BLM policy in this regard, specifically noting that exceptions to this rule could be considered only if such measures were required to prevent undue and unnecessary degradation.

BLM believes that by using COAs and Section 6 authorities, many of the objectives of the measures described in the FEIS have been or would be achieved, even on existing leases. For example, BLM would achieve the level of protection intended with the NSOs described in the FEIS because: 1) many of the NSOs in the FEIS would not be applicable to Region 4 because they are designed to protect values not present in Region 4; 2) of those NSOs which would apply, the desired level of protection could be accomplished, at least in part, by moving the operation up to 200 meters, and; 3) some of the restrictions imposed by the NSO, such as for threatened and endangered species, are considered consistent with lease rights.

Of the TLs proposed in the FEIS, restrictions on operations within big game crucial winter habitat and birthing areas would generally last for three to five months. However, BLM would only be able to restrict operations for up to 60 days on existing leases. Thus, protection of crucial big game winter ranges and birthing areas would only be partially achieved unless the operator was willing to schedule operations accordingly. Of the CSUs included in the FEIS, all objectives could be achieved, except that existing leases would preclude full protection of VRM Class II areas in Region 4 if a move of more than 200 meters were necessary to protect the Class II values. Regarding the LNs, the objectives established in the FEIS would be achieved as applicable within Region 4. However, protection of certain species of plants and animals considered sensitive by the BLM or the State of Colorado, but not listed as a federal threatened or endangered species, might not receive the full level of protection desired if a move of more than 200 meters was required to protect the species or their habitat.

Many who reviewed the Draft SEIS requested information concerning the consistency of the alternatives with existing lease rights. While the question of which mitigation proposals are consistent with lease rights and which are not must ultimately be evaluated on a case-by-case basis, it is possible to identify those mitigation proposals most likely to be inconsistent with lease rights. Those new mitigation measures included in the Preferred Alternative which involve denying locations, relocation of a well site more than 200 meters or timing restrictions greater than 60 days, could be considered inconsistent with lease rights. As such, depending on the level of cooperation of the operator, BLM would have difficulty "requiring" some of the measures described in the Preferred Alternative. Refer to Chapter 2, Section 2.5, Rationale for the Preferred Alternative, for a discussion of which of the major mitigation proposals might be considered inconsistent with lease rights.

2.4 The Preferred Alternative

2.4.1 No Surface Occupancy Stipulations (NSO)

1. Surface Coal Mines. NSO within the area of an approved surface coal mine for the conservation of natural resources. This stipulation may be waived without a plan amendment if the lessee agrees that any well approved for drilling will be plugged below the coal when the crest of the highwall approaches within 500 feet of the well, and that the well will be re-entered or redrilled after completion of mining operations through the well location. A suspension of operations and production will be considered when the well is plugged and a new well is to be drilled after mining operations move through the location.

2. Riparian and Wetland Zones. To maintain the proper function of riparian zones, activities associated with oil and gas exploration and development, including roads, transmission lines and storage facilities, are restricted to an area beyond the outer edge of the riparian vegetation. Exception: a) An exception may be granted if the AO determines that the activity will cause no loss of riparian vegetation, or that the vegetation lost can be replaced within three to five years with vegetation of like species and age class; b) Within the riparian vegetation, an exception is permitted for stream crossings, if an area analysis indicates that no suitable alternative is available.

3. Major River Corridors. NSO within one-half mile of either side of the high water mark (bankfull stage) of six major rivers: Colorado, Roaring Fork, Crystal, Frying Pan, Eagle and Piney. These riverine and adjacent areas provide: a) special status fish and wildlife species habitat; b) important riparian values; c) water quality/ filtering values; d) waterfowl and shorebird production values; e) valuable amphibian habitat; f) high scenic and recreation values. Included in this area are public lands near the Eagle and Colorado Rivers designated as Special Recreation Management Areas (SRMAs) in which BLM provides facilities to enhance recreation opportunities and maintain the recreational setting.

Note: The area north of I-70 in the NOSR Production Area is not included in this stipulation.

Exception: The distance from the river may be reduced after the AO has considered the habitat values and the species present, the topographical and vegetative characteristics of the area, and the type and amount of surface disturbance proposed. For the Eagle and Colorado Rivers, additional exception criteria include measures to mitigate impacts on recreation: a) screening operations from scenic views; b) reducing drill rig and other equipment noise to an acceptable level; c) protecting the recreating public from operations; and d) restoring disturbed areas to a condition substantially unnoticeable to the casual observer.

4. Garfield Creek, Basalt, and West Rifle Creek State Wildlife Areas. Protection of wildlife habitat values for which these areas were acquired by the state, including crucial big game and upland game winter habitat, and concentration areas and riparian values.

Exception criteria include special mitigative measures developed in consultation with the Colorado Division of Wildlife.

Note: This stipulation is essentially the same as the Continuation of Current Management version, but was modified slightly to clarify the operation of the exception.

5. **Rifle Falls and Glenwood Springs Fish Hatcheries.** NSO within a two mile radius of the hatcheries for the protection of the quality and quantity of surface water and underground aquifers supplying the Rifle Falls and Glenwood Springs Fish Hatcheries.

Exception criteria include special mitigative measures developed in consultation with the Colorado Division of Wildlife.

Note: This stipulation is essentially the same as the Continuation of Current Management version, but was modified slightly to clarify the protection of underground aquifers as well as surface waters.

6. **Grouse** (includes sage grouse, Columbian sharptailed, lesser and greater prairie chicken). NSO within one-quarter mile radius of a lek site (courtship area).

Exception: The NSO area may be altered depending upon the active status of the lek or the geographical relationship of topographical barriers and vegetation screening to the lek site.

7. **Raptors** (includes golden eagle and osprey; all accipiters; falcons, except kestrel; buteos; and owls). Raptors that are listed and protected by the Endangered Species Act are addressed separately. NSO within one-eighth mile radius of a nest site.

Exception: The NSO area may be altered depending on the active status of the nest site or the geographical relationship to the nest site of topographic barriers and vegetation screening.

8. **Bald Eagle.** NSO within one-quarter mile radius of the roost or nest site.

Exception: For roost sites, the NSO applies to the essential features of the winter roost site complex. After Section 7 consultation with the U.S. Fish and Wildlife Service, the NSO area may be altered, depending on the active status of the roost or the geographical relationship of topographic barriers and vegetation screening to the roost site.

Note: This stipulation is essentially the same as the Continuation of Current Management version, but was modified slightly to indicate the need for Section 7 consultation.

9. **Peregrine Falcon.** NSO within one-quarter mile radius of cliff nesting complex.

Exception: After Section 7 consultation with the US Fish and Wildlife Service, exceptions may be permitted.

Note: This stipulation is essentially the same as the Continuation of Current Management version, but was modified slightly to indicate the need for Section 7 consultation.

10. **Mexican Spotted Owl.** NSO within one-quarter mile radius of a roost or nest site.

Exception: After Section 7 consultation with the US Fish and Wildlife Service, exceptions may be permitted.

Note: This stipulation is essentially the same as the Continuation of Current Management version, but was modified slightly to indicate the need for Section 7 consultation.

11. **Wildlife Seclusion Areas.** NSO within fourteen seclusion areas that provide high wildlife value: The Roan Cliffs, Cottonwood Gulch, and Webster Hill/Yellowslide Gulch (all in the NOSR Production Area); Hayes Gulch; Riley and Starkey Gulch; Riley Gulch; Crawford Gulch; Magpie Gulch; Paradise Creek; Coal

Ridge; Lower Garfield; Jackson Gulch; Bald Mountain; and Battlement Mesa.

Exceptions may be granted based on approval by the AO of a mitigation plan that suitably addresses the wildlife seclusion values at risk. These areas provide several unique qualities, such as an optimum mix of quality forage, cover and water; proximity to natural migration corridors; birthing areas; topographic features which moderate severe winter conditions; and seclusion from human intrusion.

12. Threatened or Endangered Species. NSO on habitat areas for those species listed by the federal or state government as endangered or threatened, and for federal proposed or candidate species. Habitat areas include occupied habitat and habitat necessary for the maintenance or recovery of the species.

Exception: Surface occupancy may be authorized, pending Section 7 consultation with the U.S. Fish and Wildlife Service on federal Threatened or Endangered Species or with the Colorado Division of Wildlife for state listed species. The AO will consider the type and amount of surface disturbance, plant frequency and density, relative abundance of habitat, species and location, topography, and other related factors.

13. Domestic Watershed Areas. Protection of municipal watersheds providing domestic water for the communities of Rifle and New Castle.

Exception: Activity may be permitted if the AO determines, in consultation with the communities of Rifle and New Castle, that the applicant's proposal would produce only a negligible decrease in water quality.

Note: This stipulation is essentially the same as the Continuation of Current Management version, but was included with the Critical Watershed NSO. It was modified slightly to clarify the operation of the exception.

14. Debris Flow Hazard Zones. NSO for the protection of the Glenwood Springs debris flow zones.
Exception: Activity may be permitted by the AO in consultation with the City of Glenwood Springs and Garfield County, provided that the applicant's proposal will produce only a negligible increase in the risk of debris flow.

Note: This stipulation is essentially the same as the Continuation of Current Management version, but was included with the Critical Watershed NSO. It was modified slightly to clarify the operation of the exception.

15. Steep Slopes. To maintain site stability and site productivity, no surface disturbance for oil and gas facilities will be authorized on slopes greater than 50 percent. This NSO does not apply to pipelines.

Exception: In the event the lessee demonstrates that operations can be conducted without causing unacceptable impacts and that less restrictive measures will protect the public interest, an exception may be approved by the AO. A request for an exception must include an engineering and reclamation plan which provides a high level of certainty that such operations can be conducted consistent with the objectives of the GSRA Reclamation Policy. All elements of the Erosive Soils and Steep Slope CSU would apply. In addition, the operator must provide sufficient on-site analysis of soil types, vegetation types, aspect, depth to bedrock, nature of subsurface materials and potential for belowground seeps or springs. The lessee must also provide an evaluation of past practices on similar terrain and be able to demonstrate success under similar conditions. Previous success under similar conditions would be a critical element in the AO's determination.

16. Special Recreation Management Areas (SRMAs). For the protection of the recreational setting, recreation opportunities and recreation facilities provided within the SRMAs, the Class

I VRM values in the Areas of Critical Environmental Concern (ACECs) and cave resources in the Deep Creek Cave Area, no surface occupancy will be permitted within the following areas:

- Deep Creek ACEC/SRMA
- Deep Creek Cave Area (Includes no subsurface occupancy for 5,000 feet below the surface)
- Bull Gulch ACEC/SRMA
- Thompson Creek ACEC/SRMA
- Hack Lake SRMA
- Rifle Mountain Park

Exceptions: No exceptions are permitted.

17. Recreation Management Areas. For the protection of non-motorized recreation opportunities, no surface occupancy will be authorized within the following areas:

- King Mountain Area
- Siloam Springs Area
- Castle Peak Area
- Bull Gulch Area (The portion of the Bull Gulch WSA not within the Bull Gulch SRMA.)
- Sunlight Peak Area
- Fisher Creek Area (Haff Ranch)

No exceptions are permitted in any of the above areas.

- King Creek Area (840 acres on the north side of King Mountain)
- Pisgah Mountain Area

Exceptions: For the Pisgah Mountain Area, oil and gas drilling and maintenance operations on designated BLM Roads 8530, 8536 and 8585 will be permitted, since these roads are open to motorized public use. For the King Creek Area, use of the two roads previously authorized for motorized use by adjacent landowners will be permitted. These exceptions are available provided wellpads and associated facilities could be located within 100 yards of the designated (Pisgah Mountain Area) or previously authorized (King Creek Area) roads. Certain timing restrictions consistent with current travel management regulations for the affected areas will also be necessary so that operations would not substantially affect the non-motorized recreation values in the area.

Note: Non-motorized recreation opportunities are those experiences where the visitor can generally expect to see fewer people, largely due to the fact that access is more difficult or challenging, and enjoy a mostly natural setting with a higher degree of solitude and tranquillity. BLM's overall management goal for the identified areas is to maintain the non-motorized recreation opportunities. Non-motorized recreation opportunities are not exclusive of other uses; however, when other uses with the potential to conflict with these opportunities are being considered, the impact to the non-motorized recreation opportunities will be evaluated. Multiple use consistent with the GSRA RMP will be accommodated to the extent that such use has minimal impact on the non-motorized recreation opportunities.

18. Interstate 70 Viewshed. NSO on slopes over 30 percent with high visual sensitivity in the Interstate 70 viewshed. Lands with high visual sensitivity are those lands within 5 miles of the Interstate, of moderate to high visual exposure, where details of vegetation and landform are readily discernible and changes in visual contrast can be easily noticed by the casual observer on the Interstate. (Chapter 3, Section 3.12.2 contains a description of visual sensitivity.)

Exceptions would be granted if protective measures can be designed to accomplish VRM Class II objectives, namely that the overall landscape character would be retained Such measures would be designed to blend the disturbance in with the natural landscape. BLM acknowledges that activities on private lands alter the landscape character and affect the visual quality of the overall landscape. Such modifications to the overall landscape character will be considered when evaluating mitigation proposals.

19. Anvil Points Cave Area. For the protection of the scientific and wildlife values provided by these caves and to avoid the difficulties inherent in drilling such locations, no surface occupancy will be permitted in the area encompassing the cave openings, subsurface features and the watersheds immediately above the two defined caves.

Exceptions: No exceptions are identified.

2.4.2 Timing Limitation Stipulations (TL)

1. Big Game Winter Habitat (includes mule deer, elk, pronghorn antelope and bighorn sheep). Protection of winter habitat which includes severe big game winter range and other high value winter habitat as mapped by the CDOW.

- Big Game Winter Habitat - December 1 to April 30.

Exception: Under mild winter conditions, the last 60 days of the seasonal limitation period may be suspended after consultation with the CDOW. Severity of the winter will be determined on the basis of snow depth, snow crusting, daily mean temperatures, and whether animals were concentrated on the winter range during the winter months. This limitation may apply to work requiring a Sundry Notice pending environmental analysis of any operational or production aspects.

2. Big Game Birthing Areas.

- Elk Calving -April 16 to June 30
- Pronghorn Antelope Fawning - May 1 to July 15
- Rocky Mountain Bighorn Sheep Lambing - May 1 to July 15
- Desert Bighorn Sheep Lambing - March 16 to May 30

Exception for Big Game Birthing Areas: When it is determined through a site-specific environmental analysis that actions would not interfere with critical habitat function nor compromise animal condition within the project vicinity, the restriction may be altered or removed.

3. Grouse crucial winter habitat and nesting habitat (includes sage grouse, Columbian sharp-tailed, and lesser and greater prairie chickens). Sage grouse nesting habitat is described as sagebrush stands with sagebrush plants between 30 and 100 centimeters in height and a mean canopy cover between fifteen and 40 percent within a two mile radius of an active lek.

- Sage grouse crucial winter habitat - December 16 to March 15.
- Sage grouse nesting habitat - March 1 to June 30.

No exceptions are permitted for winter habitat. Exceptions: During years when the lek is inactive and it is determined that there is no nesting activity occurring by May 15, the seasonal limitation may be suspended.

Note: This stipulation was modified by the addition of the provision for sage grouse nesting habitat, which is a Lease Notice in the Continuation of Current Management Alternative.

4. Greater Sandhill Crane nesting and staging areas - March 1 to October 16.

No exceptions identified.

5. White Pelican nesting and feeding habitat areas - March 16 to September 30.

No exceptions identified.

6. Raptor nesting and fledgling habitat (includes the golden eagle and all accipiters;

falcons, except the kestrel; all buteos; and owls). Raptors that are listed and protected by the Endangered Species Act are addressed separately. A one-quarter mile buffer zone around the nest site from February 1 to August 15.

7. **Ferruginous Hawk** nesting and fledgling habitat. A one-mile buffer zone from February 1 to August 15 to avoid nest abandonment.

8. **Osprey** nesting and fledgling habitat. A one-half mile buffer zone from April 1 to August 31 to avoid nest abandonment.

Exception for raptor, ferruginous hawk and osprey (6, 7 and 8 above) nesting and fledgling habitat: During years when a nest site is unoccupied by May 15, the seasonal limitation may be suspended. It may also be suspended once the young have fledged and dispersed from the nest.

9. **Mexican Spotted Owl** nesting and fledgling habitat - February 1 to July 31.

The average Mexican spotted owl territory is estimated to encompass approximately 2,000 acres. Within this area, Primary Activity Centers (PACs) are defined around nesting, feeding, and roosting areas within the territory. These PACs are mapped as a one-half mile radius (600 acre) area around nests, roosts and the center of feeding areas, and are not considered to be overlapping. With multiple sightings of the Mexican spotted owl, but with no confirmed nest or roost sites, a PAC is defined as the area where habitat is used the most.

Exceptions may be identified after formal Section 7 consultation with the U.S. Fish and Wildlife Service.

Note: This stipulation is essentially the same as the Continuation of Current Management version, but was modified slightly to indicate the need for Section 7 consultation and to update the habitat description.

10. **Bald Eagle Nest Site.** A one-half mile buffer zone around the nest site is required to prevent disruption of nesting from December 15 to June 15.

Exceptions may be identified after formal Section 7 consultation with the U.S. Fish and Wildlife Service. The limitation may be suspended in years when the nest site is unoccupied by May 15 or once the young have fledged and dispersed from the nest.

Note: This stipulation is essentially the same as the Continuation of Current Management version, but was modified slightly to indicate the need for Section 7 consultation and to update the habitat description.

11. **Bald Eagle Winter Roost Site.** A one-half mile buffer area around the roost site is required from November 16 to April 15 to avoid relocation to less suitable areas.

Exceptions may be identified after formal Section 7 consultation with the U.S. Fish and Wildlife Service. If there is partial or complete visual screening of the area of activity, the roost site buffer may be reduced to one-quarter mile.

Note: This stipulation is essentially the same as the Continuation of Current Management version, but was modified slightly to indicate the need for Section 7 consultation.

12. **Peregrine Falcon.** A one-half mile buffer area around the cliff nesting complex from March 16 to July 31 to prevent abandonment and desertion of established territories.

Exceptions may be identified after formal Section 7 consultation with the U.S. Fish and Wildlife Service. The limitation may be suspended in years when the nest site is unoccupied by May 15, or once the young have fledged and dispersed from the nest.

Note: This stipulation is essentially the same as the Continuation of Current Management version, but was modified slightly to indicate the need for Section 7 consultation.

13. Waterfowl and Shorebird Nesting Areas. This stipulation protects nesting ducks from April 15 to July 15 in a one-quarter mile buffer around the nesting and production areas of the following reservoirs: Fravert Watchable Wildlife Area, Consolidated Reservoir and the King Mountain Reservoirs - Grimes-Brooks, Nobel and Upper and Lower King Mountain.

Exceptions may be permitted after consultation with the CDOW if nesting waterfowl and shorebirds are not present at the reservoirs, or if operations can be located in such a manner as to minimize disturbance to nesting waterfowl and shorebirds.

2.4.3 Controlled Surface Use (CSU) Stipulations

1. Underground Coal Mines. Within the area of federally leased coal lands, oil and gas operations will be relocated outside the area to be mined or located to accommodate room and pillar mining operations. This stipulation may be waived without a plan amendment if the lessee agrees that the drilling of a well will be subject to the following conditions:

- the well must be plugged when the mine approaches within 500 feet of the well bore;
- the well must be plugged in accordance with Mine Safely and Health Administration (formerly Mine Enforcement and Safely Administration) Informational Report 1052; and
- the operator will provide an accurate location of where the casing intercepts the coal by providing a directional and deviational survey of the well to the coal operator; ***or***
- relocate well into a permanent pillar or more than 500 feet outside the area to be mined. A suspension of operations and production will be considered when the well is plugged and a new well is to be drilled after mining operations move through the location.

2. Riparian and Wetland Zones. Within 500 feet of the outer edge of the riparian or wetland vegetation, activities associated with oil and gas exploration and development, including roads, pipelines and wellpads, may require special design, construction, and implementation measures, including relocation of operations beyond 200 meters, in order to protect the values and functions of the riparian and wetland zones. Such measures will be based on the nature, extent and value of the riparian or wetland area. In general, the areas immediately adjacent to the riparian vegetation are most important to the function of the riparian zone and will be avoided.

3. BLM Sensitive Species. For those species listed as sensitive by BLM and for significant natural plant communities, special design, construction and implementation measures, including relocation of operations by more than 200 meters, may be required. For plants, habitat areas include occupied habitat and habitat necessary for the maintenance or recovery of the species or communities. For animals, habitat areas are areas that are important during some portion of the lifecycle, such as nesting and production areas or communal roost areas.

4. Erosive Soils and Slopes Greater Than 30 Percent. Special design, construction, operation and reclamation measures will be required to limit the amount of surface disturbance, to reduce erosion potential, to maintain site stability and productivity, and to insure successful reclamation in identified areas of highly erosive soils and of slopes greater than 30 percent. Highly erosive soils are soils in the "severe" and "very severe" erosion classes based on NRCS Erosion Condition mapping. Areas identified in the RMP as Erosion Hazard Areas and Water Quality Management Areas are also included in this stipulation. Implementation may include relocation of operations beyond 200 meters.

The surface use plan of the APD submitted for wells on erosive soils or slopes greater than 30 percent must include specific measures to comply with the GSRA Reclamation Policy, such as stabilizing the site to prevent settling, land sliding, slumping, and highwall degradation, and controlling erosion to protect the site and adjacent areas from accelerated erosion and sedimentation and siltation of nearby water sources.

Specific performance objectives for the plan include:

a) Limitation of total disturbance to 3.0 acres for the wellpad;
b) Limitation of the interim *in use* area to 0.5 acres; and
c) Maximizing the area of interim reclamation that is shaped to a grade of 3:1 or less; any planned highwall must be demonstrated to be safe and stable and include enhanced reclamation and erosion prevention measures as needed.

The operator must also provide an evaluation of the site's reclamation potential based on problematic characteristics of the site (slope, aspect, vegetation, depth of soils, soil salinity and alkali content) and a comparison of the site with comparable sites already constructed. When the proposed site is comparable to sites where reclamation has not been successful, the operator will be required to make adjustments to reclamation techniques. Special measures might include: locating production facilities off-site; building roads to higher standards, including surfacing; constructing sediment catchments; reclaiming the reserve pit immediately after use; and applying fertilizers, mulches, soil additives and geotextile fabrics. The AO will evaluate plans submitted by the operator and approve a design and any special measures that best accomplish the performance objectives, achieving a reasonable balance of site stability and revegetation potential, and minimizing overall disturbance.

5. Visual Resource Management (VRM) Class II. Within VRM Class II areas, relocation of operations by more than 200 meters may be required to protect visual values. Protection may include special design requirements and other measures to retain the overall landscape character. Such measures would be designed to blend the disturbance in with the natural landscape so that it does not attract attention from key observation points. BLM acknowledges that activities on private lands may alter the landscape character and such modifications will be considered when evaluating mitigation proposals relative to the visual quality of the overall landscape.

6. Sharrard Park Paleontological Area. Special survey, design, construction and reclamation measures may be required, including relocation of operations beyond 200 meters, in the identified portions of Wasatch outcrops within the Sharrard Park area. The operator will provide a survey of the paleontological resources in the proposed areas of disturbance (plus a 200 foot buffer around that disturbance), performed by a BLM-permitted paleontologist. The operator will implement mitigation measures approved by the AO, instruct all on-site personnel to be aware of the potential for fossils, notify the AO if any fossils are found, and leave in place any vertebrate fossils.

2.4.4 Lease Notices (LN)

1. Class I and II Paleontological Areas. An inventory shall be conducted by an accredited paleontologist approved by the AO prior to surface-disturbing activities in these areas.

2. Biological Inventories. In areas of known or suspected habitat of special status species, or habitat of other species of interest, such as raptor nests or elk calving areas, or significant natural plant communities, a biological inventory will be required prior to approval of operations. The inventory would be used to prepare mitigating measures to reduce the impacts of surface disturbance on the affected species or their habitats. These mitigating measures may include, but are not limited to, relocation of roads, wellpads, pipelines, and other facilities, and fencing operations or habitat.

Given the high potential for sensitive species to occur in the NOSR Production Area, it is likely that a biological inventory will be required for most proposed locations in that area prior to development activities.

3. Annual Reports of Reclamation Progress. All lessees in the GSRA are required to report to the AO annually on the ongoing progress of reclamation at locations developed on the lease.

4. Emergency Communications Plan. The operator is required to prepare and maintain a current emergency communications plan. The plan shall be provided to the BLM, Colorado State Patrol, the affected county and communities, and the general public.

The plan shall contain information sufficient to describe the potential for emergency incidents related to oil and gas development which pose an immediate danger to human health and safety and would normally require immediate actions by the operator to remove the threat, such as for hazardous materials spills; actions to be taken by the operator in the event of such an incident; and a communications plan to inform appropriate authorities and potentially affected citizens.

5. Wildlife and Wildlife Habitat. Within high value or crucial big game winter range, the operator is required to implement specific measures to reduce impacts of oil and gas operations on wildlife and wildlife habitat. Such measures shall be developed in concert with BLM during the preparation of the EA. They may include completion of habitat improvement projects designed to replace habitat lost through construction activities; reduction of human disturbance in important habitat areas during critical times of the year by installing gates and closing roads; using telemetry to collect well data; and accessing well site locations during the times of the day when wildlife is not likely to be present in the area.

It is recognized that other measures may be appropriate and that not all measures would be appropriate for all areas. As such, this notice is best implemented through site-specific planning addressing several years activity in an area. Measures to reduce impacts would generally be considered when well density exceeds four wells per 640 acres, or when road density exceeds three miles of road per 640 acres.

BLM's overall goals are to: a) reduce direct impacts (physical loss of habitat) by minimizing the disturbance on lands where revegetation is not possible, such as roads, production facilities, working portions of the wellpads, exposed rock outcrops, highwalls, etc., and by offsetting the loss of productive wildlife areas during interim reclamation; and b) reduce indirect habitat impacts (reduced habitat availability for big game and other species from disturbances caused by increased human activities) in big game winter range and in other high value wildlife areas (refer to Draft SEIS, Appendix G), by managing human activities to minimize disturbance during critical times of the year.

6. Working in Wildlife Habitat. The operator is required to establish a set of reasonable operating procedures for employees and contractors working in important wildlife habitats. Such procedures would be designed to inform employees and contractors of ways to minimize the effect of their presence on wildlife and wildlife habitats. Procedures might address items such as working in bear country, controlling dogs, and understanding and abiding by hunting and firearm regulations.

7. Working in Residential Areas. The operator drilling on federal mineral estate is required to consider the impact of operations on nearby communities and residences and will be expected to reasonably adjust operating procedures to accommodate local residential concerns. For example, the operator will be expected to try to work out reasonable compromises on issues such as noise, dust, and traffic. The operator will be expected to address such issues when raised during public comment periods associated with preparation of environmental assessments or when complaints are reported to the operator, BLM or the COGCC.

8. Anvil Points Landfill. Any operations within the Anvil Points landfill area owned by Garfield County shall be consistent with the terms and conditions established in EA-CO-078-5-31.

9. Project Rulison Monitoring. Any wells located within three miles of Project Rulison will be subject to oversight measures established by the Colorado Oil and Gas Conservation Commission (COGCC). Any such wells would also be reviewed by the Department of Energy (DOE) for consideration if such wells should be incorporated into DOE's regular monitoring program.

10. Sensitive Viewsheds. Special design and construction measures may be required in order to minimize the visual impacts of drilling activities within five miles of all communities or population centers throughout the GSRA, major BLM or county roads, and state or federal highways. The overall goal of these measures would be to blend the disturbance with the natural landscape as much as possible. At a minimum, operations should be designed to insure that the disturbance does not dominate the natural landscape character (VRM Class III objective). BLM acknowledges that activities on private lands may alter the landscape character, and such alterations will be considered when evaluating mitigation proposals relative to the visual quality of the overall landscape.

2.4.5 Preferred Alternative Acreages

Total acreage figures for the various types of stipulations in the Preferred Alternative are included in Table 2.4-1. These figures and the maps in Appendix H are included to give the reader an appreciation for the extent of the stipulation. The figures should be used with caution, however. The totals are redundant in that two stipulations for different purposes may cover the same area, thus adding the acreage for each amounts to a double count. Additionally, not all the stipulations of a certain type are necessarily equivalent in the degree of restriction implied. For example, there is a substantive difference between an NSO with no exceptions and one with exceptions. On the one hand, gas drilling could be virtually eliminated whereas on the other hand, drilling plans may only need modification.

Table 2.4-1 Preferred Alternative, Stipulation Acreages

	NOSR PA	Region 4	GSRA
NSO	9,583	43,915	240,230
CSU	16,789	136,187	549,828
TL	10,71	41,000	622,000
No Lease	0	0	27,760
Total Federal Mineral Estate	12,029	163,074	568,000

2.5 Alternative Comparison

2.5.1 Summary of the Alternatives

Three alternatives were analyzed in the Draft SEIS. The Continuation of Current Management Alternative is the same as the Proposed Action in the FEIS. It includes 27,760 acres of no leasing in four WSAs; about 175,000 acres of No Surface Occupancy (NSO) for the protection of wildlife, watershed and recreation values; a group of Timing Limitations (TL) for the protection of wildlife; and Controlled Surface Use (CSU) designations for the protection of coal mines, riparian, watershed and Visual Resource Management (VRM) values.

The Maximum Protection Alternative includes all the elements of the Continuation of Current Management Alternative and additional provisions aimed at increasing the protection of surface resources and minimizing adverse environmental impacts, while still providing for oil and gas production. The alternative adds more stringent restraints on operations in riparian areas, protects wildlife seclusion areas, provides stricter control of surface disturbing activities when slopes exceed 25 percent, and extends and more closely defines protection of the visual resource.

The Proposed Action was prepared to satisfy a set of objectives stated in the Draft SEIS (page 2-4). This alternative was also based on the concept of establishing management objectives and standard operating procedures, independent of lease rights already granted, to help the BLM manage future oil and gas development activities.

The Preferred Alternative represents those mitigation measures selected from the range of alternatives that best accomplish the orderly, economic, and environmentally sound exploration and development of oil and gas resources. It employs balanced multiple-use management while being responsive to the approximately 500 cards and letters received during the comment period for the Draft SEIS.

Some reviewers suggested BLM consider an alternative that would reduce the number of wells. It was not an objective of the Draft SEIS to reduce, or increase, the number of wells drilled. The Draft SEIS was prepared, in part, to provide public disclosure of a level of development greater than originally anticipated, and to develop a set of management objectives or standard operating procedures that could be used to manage future oil and gas development. Refer to Chapter 2, Section 2.5.2, for the overall objective for the Draft SEIS and specific objectives of the Proposed Action.

Several major scoping issues were identified by BLM through a variety of methods. Refer to Chapter 1, Section 1.7, for more information concerning those issues. Refer to Chapter 2, Section 2.4.4 of the Draft SEIS for a description of the major differences between each alternative in the context of those major scoping issues. Responses to the public comments received during public review of the Draft SEIS are provided in Chapter 5 of the Final SEIS.

The following table describes the mitigation measures proposed in each of the alternatives, as well as the Preferred Alternative. Each alternative is compared to the Preferred Alternative. For example, if the table notes *Same*, it means the mitigation measure in that alternative is the same as the mitigation measure described in the Preferred Alternative. If the mitigation measure in an alternative is different than the mitigation measure in the Preferred Alternative, then the differences are noted. In a number of cases, the wording of the stipulation in the alternatives may have changed from the Continuation of Current Management alternative but the alternative remains the same in its essential elements. Appendices A, B and C provide detailed descriptions of the alternatives.

Table 2.5-1 Comparison of the Alternatives

Preferred Alternative	Proposed Action	Maximum Protection	Continuation of Current Management
No Surface Occupancy			
1. **Surface Coal Mines** - Covers the area of a federally leased surface coal mine; exceptions permitted.	Same	Same	Same
2. **Riparian and Wetland Zones** - Covers the area of riparian vegetation; exception if vegetation can be replaced and for stream crossings. ***Note:*** This alternative also includes a CSU on all lands within 500 feet of riparian areas.	Same	NSO on the riparian vegetation **plus** a 500 foot buffer on either side of the vegetation, with exceptions.	None, but included a CSU for riparian and wetland vegetation.
3. **Major River Corridors** - Covers area within 1/2 mile of six major rivers to protect natural and recreational values; exceptions permitted. ***Note:*** The NSO for the Eagle and Colorado River SRMAs listed in the three other alternatives has been incorporated into this NSO.	Same (Coloado and Eagle River SRMAs in a separate NSO)	Same (Colorado and Eagle River SRMAs in a separate NSO)	Same (River SRMAs in a separate NSO)
4. **Garfield Creek, Basalt and West Rifle Creek State Wildlife Areas** - Includes federal mineral estate within the Areas' boundaries; exceptions permitted .	Same	Same	Same
5. **Rifle Falls and Glenwood Springs Fish Hatcheries** - Includes a two-mile radius from each hatchery; exceptions permitted.	Same	Same	Same
6. **Grouse** - Area within 1/4 mile of a lek; exceptions permitted.	Same	Same	Same
7. **Raptors** - Area within 1/8 mile of a nest; exceptions permitted.	Same	Same	Same
8. **Bald Eagle** - Area within 1/4 mile of a roost or nest; exceptions based on consultation with USFWS.	Same	Same	Same
9. **Peregrine Falcon** - Area within 1/4 mile of a cliff nesting complex; exceptions based on consultation with USFWS.	Same	Same	Same

Preferred Alternative	Proposed Action	Maximum Protection	Continuation of Current Management
10. **Mexican Spotted Owl** - Area within 1/4 mile of a roost or nest; exceptions based on consultation with USFWS.	Same	Same	Same
11. **Wildlife Seclusion Areas** - 14 identified areas in Region 4; exceptions with an approved mitigation plan.	Same, but no exceptions are permitted.	Same, but no exceptions are permitted.	None
12. **Threatened or Endangered Species** - Includes habitat area of federal and state listed, candidate and proposed species; exceptions after consultation with USFWS or CDOW.	Same, but titled "Special Status Species"	NSO included BLM Sensitive species.	NSO for federally listed plant species only.
13. **Domestic Watershed Areas** - Rifle and New Castle domestic watershed; exceptions after consultation with the City of Rifle and City of New Castle.	Same	Same	Same, but included in Critical Watershed NSO.
14. **Debris Flow Hazard Zones** - Glenwood Springs area; exceptions after consultation with the City of Glenwood Springs and Garfield County.	Same	Same	Same, but included in Critical Watershed NSO.
15. **Steep Slopes** - NSO on slopes greater than 50 percent; exception with engineering plan.	NSO on slopes greater than 35 percent; exceptions.	NSO on slopes greater than 35 percent; no exceptions.	None, covered by a CSU on slopes greater than 40 percent.
16. **Special Recreation Management Areas (SRMAs)** - Deep Creek ACEC/SRMA, Deep Creek Cave Area, Bull Gulch ACEC/SRMA, Thompson Creek ACEC/SRMA, Hack Lake SRMA; Rifle Mountain Park; no exceptions permitted.	Same	Similar, but part of NSO for Semi-primitive Non-motorized Recreation Areas; no exceptions permitted.	Similar, but each area shown as a separate NSO; exceptions identified for Hack Lake and Rifle Mountain Park.
17. **Recreation Management Areas** - Sunlight Peak Area, Fisher Creek Area (Haff Ranch), Siloam Springs Area, Castle Peak Area, King Mountain Area, Bull Gulch Area (portion of Bull Gulch WSA outside the Bull Gulch SRMA); no exceptions are permitted. Pisgah Mountain Area and King Creek Area (640 acres on the north side of King Mountain); exceptions for certain existing or designated roads.	Similar, but titled Non-motorized Recreation Management Area NSO, included exception for existing roads.	Similar, but part of Semi-primitive Non-motorized Recreation Area NSO; no exceptions permitted.	NSO for Sunlight Peak Area only.

Preferred Alternative	Proposed Action	Maximum Protection	Continuation of Current Management
18. **Interstate 70 Viewshed** - Lands on slopes greater than 30 percent with high visual sensitivity in the I-70 viewshed; exceptions permitted. No exceptions for the Roan Cliffs Scenic Area (slopes greater than 60 percent).	Similar, but would apply on slopes greater than 25 percent; with exceptions. Roan Cliffs Scenic Area a separate NSO.	Similar, but would apply on slopes greater than 25 percent and includes 4 other viewsheds in Region 4; with exceptions.	None
19. **Anvil Points Cave Area** - The caves and lands in the watersheds above the caves; no exceptions.	None	None	None
Timing Limitations (TL)			
1. **Big Game Winter Habitat** - December 1 to April 30; exceptions permitted.	Same	Same	Same
2. **Big Game Birthing Areas** - Elk calving, April 1 to June 30; Bighorn Sheep Lambing, May 1 to July 15; exceptions permitted.	Same	Same	Same
3. **Sage Grouse** - Winter habitat December 16 to March 15; no exceptions permitted. Nesting habitat, March 1 to June 30; exceptions permitted.	Same	Same	Similar, but nesting habitat was protected under a LN.
4. **Greater Sandhill Crane** nesting and staging areas - March 1 to October 16; no exceptions identified.	Same	Same	Same
5. **White Pelican** nesting and feeding habitat areas - March 16 to September 30; no exceptions identified.	Same	Same	Same
6. **Raptor Nesting and Fledging Habitat** - February 1 to August 15; exceptions permitted.	Same	Same	Same
7. **Ferruginous Hawk Nesting and Fledging Habitat** - February 1 to August 15; exceptions permitted.	Same	Same	Same
8. **Osprey Nesting and Fledging Habitat** - April 1 to August 31; exceptions permitted.	Same	Same	Same
9. **Mexican Spotted Owl Nesting and Fledging Habitat** - February 1 to July 31; exceptions permitted.	Same	Same	Same

Preferred Alternative	Proposed Action	Maximum Protection	Continuation of Current Management
10. **Bald Eagle Nests** - December 15 to June 15; exceptions permitted.	Same	Same	Same
11. **Bald Eagle Winter Roosts** - November 16 to April 15; exceptions permitted.	Same	Same	Same
12. **Peregrine Falcon Cliff Nesting Complex** - March 16 to July 31; exceptions permitted.	Same	Same	Same
13. **Waterfowl and Shorebird Nesting Areas** - April 15 to July 15; exceptions permitted.	Similar, but no exceptions permitted.	Similar, but no exceptions permitted. Included a King Mountain Waterfowl Area NSO	NSO on Waterfowl Habitat Management Areas (None in GSRA)
Controlled Surface Use (CSU)			
1. **Underground Coal Mines** - Within the area of a federally leased coal mine; may be waived.	Same	Same	Same
2. **Riparian and Wetland Zones** - An area 500 feet on either side of the riparian vegetation. *Note:* The Perennial Water Impoundments and Springs NSO was dropped.	Same	Similar, but provided for an NSO on this area.	None
3. **BLM Sensitive Species** - Occupied habitat and habitat necessary for maintenance and recovery of the species.	Same, but titled Sensitive Plant and Animal Species CSU.	Similar, but NSO for these species and their habitats.	None
4. **Erosive Soils or Steep Slopes** - Areas with highly erosive soils, including Erosion Hazard Areas and Water Quality Management Areas, and slopes greater than 30 percent. All activities would require a plan to accomplish site stability and revegetation while minimizing overall disturbance. *Note:* **The Site Disturbance and Site Stability** stipulation considered in the Maximum Protection and Proposed Action Alternative has been incorporated into this CSU.	Similar, but separate CSUs for Highly Erosive Soils, Water Quality Management Areas and slopes greater than 25 percent.	NSOs on Highly Erosive Soils and Slopes greater than 35 percent, separate CSUs for Water Quality Management Areas and slopes greater than 25 percent.	Similar, but separate CSUs for fragile soils and slopes greater than 40 percent.

Preferred Alternative	Proposed Action	Maximum Protection	Continuation of Current Management
5. **Visual Resource Management (VRM) Class II** - Requires special measures to protect VRM Class II visual resource values.	Similar, but included VRM III.	Similar, but included VRM III.	Same
6. **Sharrard Park Paleontological Area** - Requires survey and mitigation plan within the area.	Same	NSO in this alternative.	None
Lease Notices (LN)			
1. **Class I and II Paleontological Area** - Requires inventory.	Same	Same	Same
2. **Biological Inventories** - Requires inventory in known or suspected habitats.	Same, but titled Special Status Species Area LN.	Same, but titled Special Status Species Area LN.	Similar, but titled Sensitive Species Area LN.
3. **Annual Reports of Reclamation Progress** - Requires operators to provide reclamation reports.	Same	Same	None
4. **Emergency Communications Plan** – Requires operator to maintain an emergency action and notification plan.	Same	Same	None
5. **Wildlife and Wildlife Habitat** - Requires operator to implement measures to address impacts on wildlife and important wildlife habitats.	Same	None, but describes several COAs which would address some wildlife mitigation.	None
6. **Working in Wildlife Habitat** - Requires operator to develop standards for employees while working in wildlife habitats.	Similar, but encourages rather than requires such standards.	None, but describes several COAs which would address use ethics for the operators.	None
7. **Working in Residential Areas** – Requires operators to address concerns associated with oil and gas development near residential areas.	Same	None, but includes a 1/4 mile NSO buffer around residences; LNs on air and water quality monitoring and on groundwater risk assessment.	None
8. **Anvil Points Landfill** – Describes operations in the Garfield County Landfill.	Same	Same	None

Preferred Alternative	Proposed Action	Maximum Protection	Continuation of Current Management
9. **Project Rulison Monitoring** - Requires that all wells within 3 miles of Project Rulison be subject to oversight measures established by COGCC.	Same	Same, but includes no leasing within 1 mile of Project Rulison.	None
10. **Sensitive Viewsheds** - Visual mitigation may be required on these viewsheds throughout the GSRA.	A CSU in this alternative, for Region 4 only.	NSO and CSU in this alternative, addressing visual impacts in 5 Region 4 viewsheds.	None

2.5.2 Comparing the Alternatives with the Objectives of the Proposed Action

Objectives to be accomplished by the Proposed Action are:

1. Provide a reasonable balance between surface resources and subsurface values.
2. Be consistent with Federal and State laws and policies.
3. Consider the long-term as well as the short-term and do not preclude options for the future.
4. Be understood by all stakeholders.
5. Acknowledge public concerns.
6. Establish BLM's preferred management objectives and best management practices, even if current lease rights might preclude such options.
7. Acknowledge BLM's multiple-use mandate.
8. Support BLM's Land Health Standards.

The matrix below rates each alternative as high, medium or low in terms of the extent to which it accomplishes the objective and describes how each of the alternatives accomplished that objective.

Table 2.5-2 Comparing the Alternatives with the Objectives of the Proposed Action

Objectives for the Proposed Action	Preferred Alternative	Proposed Action Alternative	Maximum Protection Alternative	Continuation of Current Management Alternative
1. **Provide a reasonable balance between surface resources and subsurface values.**	**High.** Trades off some potential oil and gas extraction opportunities for reasonable restrictions on more severe slopes, most sensitive visual areas and habitats of special concern for wildlife.	**Medium.** Provides reasonable opportunities for oil and gas extraction, but includes some protective measures that are unnecessary.	**Medium.** Includes some protective measures that are unnecessary or extreme, overly restricting oil and gas extraction.	**Medium.** Provides reasonable opportunities for oil and gas extraction, but restrictive measures are insufficient in some cases.

Objectives for the Proposed Action	Preferred Alternative	Proposed Action Alternative	Maximum Protection Alternative	Continuation of Current Management Alternative
2. **Be consistent with Federal and State laws and policies.**	**High.** Consistent with all applicable laws and policies.	**High.** Consistent with all applicable laws and policies.	**High.** Consistent with all applicable laws and policies.	**High.** Consistent with all applicable laws and policies.
3. **Consider the long-term as well as the short-term and not preclude options for the future.**	**High.** Tends to promote moderate levels of extraction in the short term under current market conditions with current technology, though some development opportunities limited due to constraints.	**Medium.** Tends to defer development potential on more extreme slopes, highly sensitive visual areas and important wildlife habitat areas. These area will likely be unavailable in the short term.	**Medium.** Tends to defer development on more lands that will be unavailable in the short term unless technology advances sufficient to facilitate oil and gas extraction with directional drilling at greater offset distances.	**Medium.** Tends to promote higher levels of extraction in the short term under current market conditions with current technology, though some development opportunities limited due to constraints.
4. **Be understood by all stakeholders.**	**High.** A rationale for the Preferred Alternative has been provided in the Final SEIS and public comments have been addressed.	**Medium.** Many reviewers didn't understand the changes to the fragile soils, steep slopes and riparian areas CSUs as well as some of the exception criteria for the NSOs.	**Medium.** Many reviewers did not understand the basis for some of the protective measures contained in this alternative.	**Low.** Many reviewers don't understand how this alternative works in a lease rights environment.
5. **Acknowledge public concerns.**	**High.** Responsive to the widest array of comments.	**Medium.** Responsive to many comments on both sides of the issue, but adjustments were necessary based on public comments on the Draft SEIS.	**Medium.** Provides greatly enhanced protection to surface values, the area of concern of the majority of reviewers. Very responsive to issues raised in scoping prior to release of the Draft SEIS.	**Medium.** Oil and gas activities have been the subject of growing public concerns for the past several years and many issues have been raised regarding perceived inadequacies of current practices.

Objectives for the Proposed Action	Preferred Alternative	Proposed Action Alternative	Maximum Protection Alternative	Continuation of Current Management Alternative
6. **Establish BLM's preferred management objectives and best management practices.**	**High.** Provides reasonable direction, though some aspects still need discussion at the field level. Provides additional direction regarding operations on existing leases and a rationale for the Preferred Alternative.	**Medium.** Provided reasonable direction but some objectives and/or exceptions were unclear. Did not adequately address operations on existing leases.	**Medium.** Provided reasonable direction but some objectives and/or exceptions were unclear. Did not adequately address operations on existing leases.	**Low.** Provided only moderate direction regarding activities on existing leases and did not address NOSR Production Area.
7. **Acknowledge BLM's multiple use mandate.**	**High.** Tends to establish surface resource protection levels and oil and gas development opportunities mid-range between the most restrictive and least restrictive alternatives. Completely consistent with multiple use policy.	**High.** Tends to establish surface resource protection levels and oil and gas development opportunities mid-range between the most restrictive and least restrictive alternatives. Completely consistent with multiple use policy.	**Medium.** Tends to provide greater levels of protection to surface resources and fewer opportunities for oil and gas development, but completely consistent with multiple use policy.	**Medium.** Tends to provide greater opportunities for oil and gas development and lower levels of protection to surface resources than the other alternatives, but completely consistent with multiple use policy.
8. **Achieve BLM's Land Health Standards for soils, riparian systems, plant and animal communities, special status species and water quality.**	**Medium.** Tends to moderately impact soils, riparian systems, plant and animal communities and water quality. Less potential to affect BLM sensitive species.	**Medium.** Tends to moderately impact soils, riparian systems, plant and animal communities and water quality. Less potential to affect BLM sensitive species.	**High.** Tends to be least impacting to soils, riparian systems, plant and animal communities, special status species and water quality.	**Low.** Tends to be more impacting to soils, riparian systems, plant and animal communities and water quality. Potential to affect BLM sensitive species.

2.6 Rationale for the Preferred Alternative

In addition to accomplishing the objectives described above, the Preferred Alternative was designed to address specific resource protection needs documented in Chapter 4, Environmental Consequences. In most cases, impacts from oil and gas development activities on federal mineral estate in Region 4 are not the primary cause of the landscape alterations that have contributed to a variety of direct and indirect natural resource impacts. Rather, it is the cumulative nature of the impacts associated with residential, agricultural and other commercial land uses. This includes the extensive transportation system of federal and state highways and county roads that has necessitated the changes in current oil and gas operating procedures described in the Preferred Alternative. Evaluated independent of other land uses, some of the measures may seem unnecessary. However, in the context of the overall landscape modifications to date as well as trends, it is apparent that oil and gas activities will continue to influence natural landscapes sufficient to warrant reasonable additional measures to reduce impacts of oil and gas development. This would result in a reduction of the contribution of oil and gas operations to cumulative impacts throughout Region 4. Therefore, certain measures like the Wildlife Seclusion Areas NSO, and Wildlife and Wildlife Habitats Lease Notice, were included in the Preferred Alternative, though such measures would perhaps not have been considered necessary in more remote parts of the state that have not already been affected by relatively heavy development of all kinds.

Despite the fact that additional restrictions will make some public lands unavailable and/or increase the costs of oil and gas extraction sufficient to make some well locations uneconomical, BLM believes that the additional protective measures are warranted in order to accomplish the objectives of the Proposed Action. This additional protection is not without economic tradeoffs, however. The Final SEIS, Chapter 4, Part 4.20.2.3. estimates that the Preferred Alternative will result in the loss or postponement of gas production of five percent or less on federal mineral estate, compared to the Continuation of Current Management Alternative. This represents a loss of about 1,100,000 MCF annual production and perhaps 15,000,000 MCF of gas reserves, equating to about $220,000 in annual federal royalty loss and $3,000,000 total federal royalty loss. However, this loss is not expected to change employment levels, nor does it represent a significant percentage of total gas production in Colorado. For example, the total production from 300 wells on federal mineral estate in Region 4 is anticipated to be about 23 million MCF annually, less than four percent of all gas production in Colorado in 1996.

The basis for many of the additional protective measures in the Preferred Alternative was established in the FEIS. However, BLM experience with oil and gas operations in Region 4 since the completion of the FEIS and the additional analysis provided in the SEIS suggest refinements of the current protective measures are necessary to better accomplish the goals established in the FEIS. For example, while the FEIS committed to protecting VRM Class II areas, BLM has determined that the associated CSU may be inadequate in those situations where special design considerations or even moves of greater than 200 meters may be inadequate to achieve VRM Class II objectives. As such, the Preferred Alternative includes an NSO that gives BLM authority to actually deny well locations on a case-by-case basis if necessary to achieve VRM Class II objectives. While BLM feels that the CSU would have been adequate in most instances, it is important that BLM has the necessary authority to more fully achieve the objective, even in the more unusual situations.

Some elements of the Preferred Alternative reflect new information or new issues not specifically addressed in the FEIS. For example, the FEIS included little acknowledgement of the potential impacts of oil and gas operations on quality of life of nearby residents, nor did the FEIS specifically include measures to protect non-motorized recreation opportunities. The FEIS discussed visual resources, but a much more refined analysis is provided in the SEIS. Finally, though the FEIS included a cumulative impact analysis, the SEIS contains a more extensive analysis of cumulative impacts within Region 4.

2.6.1 Rationale for Elements of the Preferred Alternative

Many of the mitigation measures in the Preferred Alternative are from the Continuation of Current Management Alternative, and were maintained through all the alternatives. (See Table 2.4-1.) The rationale for these measures was established in the FEIS and will not be restated here. The rationale for selecting those mitigation measures in the Preferred Alternative, which varied across at least one of the alternatives, is discussed below. In each case, the rationale discussion is followed by a brief description of the effect of pre-existing lease rights on the operation of the mitigation measures.

Riparian and Wetland Zones. (NSO on riparian and wetland vegetation areas, CSU on a 500 foot riparian buffer.) Riparian areas are extremely important natural habitats and limited in their extent. Road construction for a variety of purposes has already affected more than 50 percent of the riparian areas in Region 4. Any road within 500 feet of a stream leads to a variety of direct and indirect impacts to the riparian area. Direct impacts include actually removing the riparian vegetation along the roads or at road crossings. The Preferred Alternative, the Proposed Action and the Maximum Protection Alternative all utilize an NSO stipulation to protect the actual riparian vegetation; the Continuation of Current Management Alternative used a CSU stipulation. The very high value placed on riparian vegetation and the relatively small amount of riparian habitat that has not already been affected warrant a high degree of protection.

The indirect impacts of roads near riparian areas are more variable and sometimes hard to measure, like disturbing the birds which nest in the riparian areas, or increasing the sediments which may flow into the streams and potentially affect water quality. Normally, a reasonable buffer along the riparian area and standard road construction techniques will provide reasonable protection to the riparian area. In most instances, moving a well location away from the stream will reduce indirect impacts to the riparian area as well. However, in some instances, moving a proposed well to provide a buffer for the riparian area would place it on a steep, erosive, or otherwise unsuitable slope. To address this situation, a CSU was included in the Proposed Action and the Preferred Alternative to permit moves of more than 200 meters. This CSU provides the AO greater discretion to address this situation than is provided by the Continuation of Current Management Alternative.

The Maximum Protection Alternative called for a 500 foot buffer around all riparian areas and would provide the highest degree of protection to riparian and wetland values. However, even with the exceptions listed, such restrictions could effectively preclude oil and gas development around some riparian areas. With proper planning, gas wellpads and roads can be designed to minimize impacts to riparian areas. As documented in Chapter 4, oil and gas development has contributed little to riparian impacts to date. In addition, BLM has authority to move any well up to 200 meters (approximately 660 feet) on all leases, essentially accomplishing the intent of the Maximum Protection Alternative if necessary. To restrict oil and gas operations as described in the Maximum Protection Alternative would be overly restrictive and in many cases unnecessary. The CSU in the Preferred Alternative provides additional authority that may be necessary in some situations where wells are proposed in steep canyons with riparian areas.

Existing Leases and Lease Rights. In most cases, achieving the objectives of the NSO will be possible on existing leases. There will occasionally be cases where all potential locations in a stretch of riparian vegetation should be denied, but usually, moving the well up to 200 meters will be sufficient to minimize impacts to riparian areas. Without the ability to move a well more than 200 meters as provided by the CSU in the Preferred Alternative, wells will likely be approved in some locations under old leases that might otherwise be moved. This NSO and CSU would be fully implementable on all areas to be leased after the Final SEIS, including the NOSR Production Area.

Wildlife. (Wildlife Seclusion Areas NSO, Wildlife and Wildlife Habitats LN, Working in Wildlife Habitats LN, and Waterfowl and Shorebird Nesting TL) Chapter 4 documents the substantial effects of human activities on wildlife habitats throughout Region 4. Agricultural practices, commercial and residential development, including oil and gas activities, and the extensive network of roads are primary influences on natural habitats throughout Region 4. In some local areas, these activities may have completely altered the natural landscape. In other locations, such activities have simply influenced the normal functions of that landscape, potentially affecting raptors, upland game birds, waterfowl, predators, fur-bearers, small game and non-game species, as well as big game. The exact effect of human disturbances varies with the location, nature and scope of the disturbance, and the wildlife species involved. Big game, like deer and elk, are often the most visible and abundant wildlife species with the most potential to be affected in Region 4.

Throughout Region 4 as a whole, development of BLM lands for oil and gas has only a small direct effect on these habitats, mostly at wellpads and along roads. However, construction and operation disturbances emanating from these areas reduce the effectiveness of wildlife habitat in a much larger area. For example, habitat effectiveness for mule deer is reduced up to one-eighth mile on either side of a road and for elk up to one-half mile. In several, more localized areas such as the drainages west of Parachute Creek, oil and gas activities are the dominant contributors to changes in the landscape.

As population growth and the associated residential development continue throughout Region 4, the value of the public lands for wildlife, open space, scenic vistas and recreation tend to be more important, especially to the local residents. More than 85 percent of the oil and gas operations on BLM land have occurred in mule deer winter range and 50 percent on elk winter range. The condition of these winter ranges becomes more critical as private lands, which once provided abundant winter range for big game, are subdivided. While oil and gas development may not be the primary cause of impacts to wildlife habitats, it is a factor, especially in several localized areas. Thus, future impacts to wildlife habitats on public lands, which are becoming more and more important, cannot be discounted.

The Preferred Alternative requires the operator to consider the impacts of oil and gas activities and work with the BLM to develop and implement appropriate measures to reduce the effects of their operations on wildlife and wildlife habitat. Unlike the Maximum Protection Alternative, the Preferred Alternative does not describe specific measures, but directs the operator to consider such measures when APDs are submitted. In this way, appropriate and reasonable measures can be developed in a cooperative manner, insuring such measures address site-specific issues and the needs of wildlife and their habitats. The Preferred Alternative also directs the operator to establish standards of conduct for temployees while working in important wildlife habitats to help reduce the impact of human activities on wildlife.

Wildlife Seclusion Areas are portions of the upper reaches of several watersheds that provide mostly unfragmented natural habitats, relatively unaffected by human activities. These areas offer unique opportunities for wildlife solitude, since about 55 percent of mule deer winter range and nearly 95 percent of elk winter range has already been at least indirectly impacted by roads. Within Region 4, there are over 2,000 miles of road. This network of federal, state, county, private, BLM and Forest Service roads was constructed for many purposes: agricultural, residential, recreational and commercial. Road densities at various locations throughout Region 4 exceed four miles per square mile. Habitat effectiveness may diminish as much as 30 percent when road densities are greater than about three miles per square mile. Though less than fifteen percent of these roads were constructed specifically for oil and gas development purposes, future oil and gas development activities will contribute towards the already substantial impacts of the road network on important deer, elk and other wildlife habitats. Given the substantial affects of human disturbance throughout Region 4, protection of the wildlife and habitat provided in wildlife seclusion areas is important.

No consideration of the value of the Wildlife Seclusion Areas is contained within the Continuation of Current Management Alternative. Since these areas contain some private land and it is not within BLM's authority to dictate management of private lands, exceptions to the NSO (which were not permitted under the Maximum Protection Alternative and the Proposed Action) are called for so that private landowners can continue to exercise their property rights. Additionally, since much of the public land within the Wildlife Seclusion Areas has already been leased, exceptions to the NSO will enable the BLM to provide for the exercise of lease rights already granted. The Preferred Alternative also recognizes that some development for oil and gas inside the seclusion areas might have minimal impacts on the wildlife seclusion values if consideration of the seclusion values is factored into development plans and if appropriate mitigation is developed.

Waterfowl and shorebird nesting and production areas are limited in the GSRA. Special measures are necessary to protect those reservoirs on BLM lands which provide these values. Given the limited extent of this habitat, the proposed timing limitation for waterfowl and shorebird nesting areas will have negligible effect on oil and gas development potential. The NSO for Waterfowl in the Continuation of Current Management Alternative referred to formally designated Waterfowl Management Areas, which are not found in the GSRA.

Existing Leases and Lease Rights. Most of the Wildlife Seclusion Areas have already been leased. Provided mitigation plans can be developed for operations within these areas, much of the intent of the NSO can be implemented consistent with lease rights. However, in some instances, it is possible that BLM would prefer to deny locations within the Wildlife Seclusion Area; this would be inconsistent with lease rights. This NSO would be fully implementable on all areas to be leased after the Final SEIS, including the NOSR Production Area. Implementation of the Lease Notices is consistent with lease rights granted, provided all mitigation measures are adequately justified in the environmental assessment prepared for the APD(s).

Threatened and Endangered Species. (NSO for federal and state threatened and endangered species and CSU for BLM sensitive species.) The Endangered Species Act (ESA) is designed to protect all federal listed or candidate species and those species proposed for listing. In addition to the list of threatened and endangered species maintained by the U.S. Fish and Wildlife Service, the State of Colorado also maintains a threatened and endangered species list. BLM also maintains a list of sensitive species. Refer to Section 3.6 for more information concerning these classifications. It is BLM policy to consider all the species on any of these lists in all management decisions. Species on the federal list have the most protection under law, while species on the state and BLM list are generally protected by BLM policy.

The ESA applies to all oil and gas operations, regardless of language contained in the lease. However, the ESA does not protect species on the state threatened and endangered list or the BLM sensitive list. Species on these lists are of sufficient concern to warrant special management attention; though they may not be on the federal list at this time, their presence or habitat is either sufficiently uncommon, or very little is known of the species or their habitat requirements. Therefore, careful consideration of these species is necessary to avoid taking actions which might lead to the species' decline such that the species would qualify for listing and protection under the ESA.

All alternatives protect all federal listed or candidate plant and animal species and those plant and animal species proposed for listing. The Continuation of Current Management Alternative uses a LN to protect plant species on the BLM sensitive species list, but does not address species on the state list. The Maximum Protection Alternative adds protection for species on the state list and equivalent protection to species on the BLM sensitive list. The basis for protection of species on the BLM sensitive species list is BLM policy rather than law or regulation. BLM policy recognizes that different levels of protection may be appropriate for certain species based on local, on-the-ground information. The NSO in the Preferred Alternative provides the needed protection to those species protected by federal law as well as species on the state list, but uses a CSU to provide greater management flexibility, consistent with BLM policy, for species on the BLM sensitive list.

Existing Leases and Lease Rights. Existing lease rights might preclude full protection of BLM sensitive or State of Colorado listed species to the extent prescribed in the Preferred Alternative, though in most cases, moving wells up to 200 meters will be sufficient to protect all special status and sensitive species. This NSO and CSU would be fully implementable on all areas to be leased after the Final SEIS, including the NOSR Production Area.

Steep Slopes and Erosive Soils. (NSO on slopes greater than 50 percent and a CSU on erosive soils and on slopes between 30 and 50 percent.) On steep slopes or highly erosive soils, oil and gas operations require special attention during construction and maintenance to prevent increased erosion and loss of site stability and to reduce impacts to site productivity. It was BLM's intent in the Preferred Alternative to *establish "slopes of concern* on which special conditions would be required, and an *upper limi*" to the slope on which oil and gas operations be conducted. Such delineation would be helpful for future planning purposes and would give the public and the operator greater certainty in regard to operations on steeper slopes. Some who reviewed the Draft SEIS requested such slope limits, while others argued for flexibility.

An *upper limit* is very difficult to define because so much depends on the nature of the actual slope, the construction methods employed and the reclamation techniques applied. Nonetheless, based on BLM experience in Region 4, constructing oil and gas wellpads on slopes greater than 50 percent has a higher potential for reclamation failure. On these slopes, operations are more likely to lead to site instability, resulting in increased surface runoff and accelerated erosion rates, causing unacceptable losses of site productivity. In addition, as slopes approach 50 percent, some construction and reclamation equipment approaches performance limits and may not be completely functional; some reclamation techniques also become less effective.

Based on BLM experience in Region 4, supported by guidelines for reclamation success established in BLM Manual 3000, wellpads with cut-and-fill slopes of 3:1 or less are more likely to be successfully reclaimed than cut-and-fill slopes with greater ratios. Due to the constraints of terrain with such slopes, cuts and fills of 3:1

or less cannot easily be achieved on slopes greater than 30 percent. On slopes greater than 30 percent, terracing or highwalling may be necessary, resulting in the potential for some loss of site productivity. On steep slopes, reshaping and stabilization of cut-and-fill slopes becomes more difficult, erosion control problems increase and reclamation potential decreases. Highly erosive soils, even on more moderate slopes, are often more difficult to reclaim. Therefore, additional measures are needed on erosive soils and slopes greater than 30 percent to insure successful reclamation. Accordingly, such slopes represent *slopes of concern.*

A primary element of this NSO for slopes greater than 50 percent in the Preferred Alternative is that BLM has the authority to deny locations unless a construction and reclamation plan is provided and approved by the AO. Such a plan must provide a high level of certainty that such operations can be conducted consistent with the objectives of the GSRA Reclamation Policy. All elements of the CSU for highly erosive soils and slopes greater than 30 percent would apply; however, it is BLM's intent with this NSO that the criteria for granting exceptions be much more stringent than the conditions under which operation on slopes greater than 30 percent would be authorized. Critical to more stringent criteria is a requirement that the operator additionally provide sufficient on-site analysis of soil types, vegetation type, aspect, depth to bedrock, nature of subsurface materials and potential for below-ground seeps or springs. The operator must also provide an evaluation of past practices on similar terrain and be able to demonstrate success under similar conditions.

The Proposed Action restricts operations on slopes greater than 35 percent, providing for some limited exceptions for short segments of road or a portion of a well pad. The upper slope limit of oil and gas operations should be the ability of the operator to achieve GSRA's reclamation goals and other objectives described in the Final SEIS. BLM experience in Region 4 suggests that operations on slopes greater than 35 percent can be quite successful and does not support the need for an NSO at 35 percent. As reclamation techniques improve and as operators demonstrate reclamation success on steeper slopes, then reasonable exceptions should be granted. Therefore, the Preferred Alternative replaces the Steep Slopes NSO, Highly Erosive Soils CSU, and Site Disturbance and Site Stability CSU of the Proposed Action with the Steep Slopes NSO (greater than 50 percent) and Erosive Soils and Slopes Greater Than 30 Percent CSU. The Preferred Alternative recognizes the inherent difficulty of developing oil and gas on erosive soils and on slopes greater than 30 percent, but provides performance-based exceptions that potentially open up more BLM land for oil and gas development than the Proposed Action, while establishing reasonable controls to accomplish the needed protection on erosive soils and steeper slopes. It is likely that some increase in overall well numbers over the next 20 years might occur due to the changes in the slope stipulations. Thus, well numbers and production are expected to be slightly higher under the Preferred Alternative compared to the Proposed Action. However, since the magnitude of the change is not known, BLM did not change the number of wells assumed for the Preferred Alternative.

The Steep Slopes NSO does not apply to pipelines because, with proper design and construction methods, pipelines can more easily be constructed on slopes in excess of 50 percent with satisfactory results. The difference is primarily that pipelines are either located on the surface or buried. In either case, the surface is restored to its natural contours, leading to much more successful reclamation.

The Continuation of Current Management Alternative requires special attention to operations on slopes greater than 40 percent, but requires only that the operator provide an engineering/reclamation plan based on less than definitive criteria and does not give the AO authorization to actually deny a location if necessary; this protection is inadequate. The Maximum Protection Alternative provides an NSO with no exceptions on all slopes greater than 35 percent. While this could avoid all operations on all slopes greater than 35 percent, BLM's objectives are not to avoid the steeper slopes, but to accomplish successful reclamation and maintain site stability.

Existing Leases and Lease Rights. Since much of the public land within Region 4 has already been leased, it must be recognized that existing lease rights might preclude full protection of highly erosive soils and steep slopes to the extent prescribed in the Preferred Alternative; some wells will likely be approved in locations under old leases that might otherwise be moved. However, even under old leases, BLM can require the level of planning described in the NSO and CSU.

Regarding operations on existing leases on slopes greater than 50 percent, denying a location based on this NSO might be considered inconsistent with lease rights. However, based on a site-specific analysis, BLM could conclude that the impacts of constructing wellpads on slopes greater than 50 percent are undue and unnecessary, given the difficulties in reclamation. In such cases, directional drilling would also be considered as an alternative to facilitate the leaseholder's rights to extract the oil and gas resources while providing reasonable protection to surface values.

With appropriate design standards, BLM could accomplish the intent of the CSU in most cases. In situations where BLM might prefer to move a location more than 200 meters because of the difficulties inherent in a particular site, lease rights might preclude accomplishing the full intent of the measure. The NSO and CSU would be fully implementable on all areas to be leased after the Final SEIS, including the NOSR Production Area.

Recreation Management. (NSO on certain non-motorized SRMAs and RMAs.) Throughout the GSRA, 57 percent of the public lands are available for use without travel management limitations and 37 percent are available for motorized travel with seasonal limitations or travel limited to existing or designated routes. Less than five percent of the public lands in the GSRA are open to non-motorized uses only.

Many of the recreation management areas covered by this NSO have been identified by BLM since the completion of the 1984 RMP as having important natural and recreational values. Travel management restrictions have been adopted within these areas to provide for essentially non-motorized recreation uses. Travel in these areas is generally limited to a few, if any, designated routes. Based on a recent travel management plan completed in the Castle Peak Area (1997) and on visitor contacts with members of the public using the King Mountain Area (on-going), there is a great deal of public interest and support for establishing and maintaining opportunities for non-motorized recreation. Oil and gas operations, including road and facility construction, and operation of motor vehicles throughout the year, would be incompatible with the non-motorized recreation values provided in these recreation management areas. In addition, most of these areas appear to have low potential for oil and gas development, so such restrictions would appear to have little impact on oil and gas development.

Exceptions to the NSO are provided in the Pisgah Mountain Area because several roads are designated and open for public use according to current travel management designations. Use for oil and gas operations along these roads would have negligible impact on non-motorized recreation opportunities. Such use, coupled with some seasonal restrictions, would be consistent with the applicable travel management designations for the area. An exception is also provided for the King Creek Area (approximately 640 acres) because the area contains several existing roads which provide motorized access for the public to the BLM King Creek Trailhead and/or for private landowners to access adjacent private lands. These roads receive regular motorized traffic. In addition, the King Creek Area is in the vicinity of other oil and gas operations, indicating some potential for oil and gas in the area. The exception would provide some opportunity for oil and gas exploration and development. Use of such roads, coupled with some seasonal restrictions, would have negligible impact on non-motorized values in the area.

Existing Leases and Lease Rights. Since the Recreation Management Areas have not been leased, the areas would be leased with appropriate stipulations from the SEIS and there would be no lease rights questions.

Visual Resource Management. (Interstate 70 Viewshed NSO, VRM Class II CSU and Sensitive Viewsheds LN.) Scenery is an important component of the lifestyle of many residents of western Colorado and a primary motivation for travelers and tourists to visit the state. Interstate 70 bisects the GSRA and is one of the most highly traveled routes in Colorado. It is the primary transportation corridor in western Colorado, bringing millions of visitors to the area, connecting Colorado communities and facilitating interstate travel for residents and tourists. The scenery along Interstate 70 is some of the most dramatic in the state; it leaves lasting impressions on the traveler. As communities along I-70 continue to grow and residential and commercial development increases at some of the fastest growth rates in the state, public lands become even more critical components of this important viewshed. As such, management of public lands along Interstate 70 must consider these important scenic values. Accordingly, the Preferred Alternative establishes an NSO on slopes greater than 30 percent with high visual sensitivity in the Interstate 70 viewshed. The Preferred Alternative is similar to the Proposed Action and Maximum Protection Alternative, but those alternatives establish 25 percent as the slope limit. BLM reevaluated the slope criteria and revised it to 30 percent in the Preferred Alternative, to be consistent with the slopes described in the CSU for highly erosive soils and slopes greater than 30 percent; disturbances more likely to be reclaimed present less potential for more noticeable impacts to visual resources. Additionally, the method of assessing visual sensitivity is a more precise way to determine visual values than the VRM classification scheme.

The Continuation of Current Management Alternative provides for a CSU to protect all VRM Class II scenic values which would cover the Interstate 70 viewshed. Such a CSU would generally provide sufficient protection. However, in some situations it may be necessary for the AO to actually deny a location and the Continuation of Current Management Alternative might not provide for such discretion.

After wilderness study areas and ACECs, which are managed as VRM Class I areas, VRM Class II values are the most important visual values in the GSRA. As such, these most important and visually sensitive areas must be protected. Under all alternatives, VRM Class II values would be protected with a CSU which authorizes moves of greater than 200 meters. BLM's overall goal in these areas is to maintain the overall character of the landscape and blend disturbances with the natural environment so as not to be seen by the casual observer. All alternatives establish the same level of protection for VRM Class II areas.

With over 1,800 miles of boundary along private lands and more than 80 percent of the public lands in the GSRA within five miles of private land, BLM lands are a primary component of the viewsheds of many communities, unincorporated residential centers, and residents of dispersed rural homesites.

The Continuation of Current Management Alternative does not explicitly recognize the scenic values of BLM lands to residents; it protects VRM Class II areas, but is inadequate to provide special consideration for local viewsheds. The Maximum Protection Alternative would have provided a level of protection comparable to the Interstate 70 viewshed for certain communities and residential centers in Region 4. The Preferred Alternative recognizes the importance of community viewsheds throughout the GSRA, as well as other major travel corridors, and includes a LN that signals BLM's intent to minimize the impacts of oil and gas operation on all these community viewsheds. This does not provide the same level of protection to these community viewsheds as the Interstate 70 viewshed.

The Maximum Protection Alternative would extend similar protection to VRM Class III areas and directs oil and gas operations be conducted so as to maintain the overall character of the landscape and blend disturbances with the natural environment so as not to be seen by the casual observer. Providing the same level of protection to VRM Class III areas and community viewsheds as the Interstate 70 viewshed would have effectively precluded oil and gas development in much of the GSRA; with more than 20 different communities, abundant residential centers, and many dispersed rural homesite throughout the area, it would be impractical to conduct oil and gas operations only in areas not visible by anyone. The patterns of residential development and the nature of the topography in this area are such that, while some lands might be screened from some residents, and thus seem a logical place to locate oil and gas facilities, those same lands will be seen from residents on the other side of the ridge or valley. In addition, managing public lands for oil and gas operations is an important part of BLM's multiple-use mandate. BLM recognizes that multiple-use activities conducted on BLM lands will be seen by BLM's neighbors. While reasonable steps will be taken to reduce impacts associated with any multiple-use activity, it is not BLM's objective to accomplish VRM Class II objectives throughout the GSRA. Therefore, the option of moving operations more than 200 meters as part of the CSU in the Preferred Alternative was not selected because it would lead to expectations of many that BLM would simply move the operation from their view. As described above, many BLM lands are visible to someone and moving an operation from one view in many cases will simply move the operation into someone else's view. Thus, the 200 meter move requirement would lead to unreasonable expectations - an unacceptable effect on oil and gas operations.

Existing Leases and Lease Rights. Since much of the public land within Region 4 has already been leased, it must be recognized that existing lease rights might preclude full protection of the scenic values within the Interstate 70 viewshed to the extent prescribed in the NSO; some wells will likely be constructed in locations on existing leases that might otherwise be moved. The stipulation provides management goals which BLM would try, at a minimum, to accomplish on a voluntary basis. This NSO would be fully implementable on all areas to be leased after the Final SEIS, including the NOSR Production Area.

Anvil Points Cave Area NSO. This unique cave area was brought to BLM's attention by a reviewer of the SEIS. The small area provides habitat for bats and presents operational problems to the industry; as such, it should be avoided during drilling operations.

Sharrard Park Paleontological Area CSU. The Sharrard Park area near the Anvil Points Landfill contains scientifically important fossils. While moving proposed well locations more than 200 meters would generally provide adequate protection to fossils, the CSU provides additional discretion to the AO to require a move greater than 200 meters when appropriate.

Existing Leases and Lease Rights. Since much of the public land within the Sharrard Park Paleontological Area has already been leased, it must be recognized that existing lease rights might preclude full protection of the paleontological values to the extent prescribed in the Preferred Alternative, but the stipulation provides management goals which BLM would try, at a minimum, to accomplish on a voluntary basis. This NSO would be fully implementable on all areas to be leased after the Final SEIS, including the NOSR Production Area.

Biological Inventories LN. Section 6 of the Standard Lease Terms provides the BLM authority to require appropriate inventories be conducted by the operator prior to surface disturbing actions. Primarily, surveys for threatened and endangered and sensitive plants and cultural resources surveys have been required to date. This lease notice established BLM's intent to require more comprehensive biological inventories, including BLM sensitive species and other important species of concern, for future oil and gas operations. BLM will describe the exact nature of the inventories based on a case-by-case review of existing information.

Annual Reports of Reclamation Progress LN. Per the GSRA Reclamation Policy dated July 18, 1997, operators will be required to report on the status of reclamation and associated activities. Such reporting was not included in the Continuation of Current Management Alternative but included in the Preferred Action, the Proposed Action and the Maximum Protection Alternative.

Emergency Communications Plan LN and Working in Residential Areas LN. As population growth and the associated residential development continues throughout Region 4, the conflicts between oil and gas development and residential development will continue. While in the eyes of some, such uses will never be compatible, it is important that BLM, the operators, the neighbors, and other regulating agencies try whatever is reasonable to find a way to accommodate these equally valid land uses. The Preferred Alternative requires the operator to reasonably adjust operations to address concerns of local residents and establishes BLM's expectation that the operators work out reasonable compromises. The Maximum Protection Alternative would have established a one-quarter mile buffer around residences, but such a buffer was determined to be unreasonable because, with over 1,800 miles of boundary with private land, such a buffer would have effectively precluded oil and gas development on many acres of public land. With authority to move locations up to 200 meters, BLM has ample authority to adjust locations and provide reasonable buffers to nearby residents based on local conditions. The Maximum Protection Alternative also included requirements of the operator for air and water quality monitoring under certain circumstances as well as a requirement of the operator to conduct a groundwater risk assessment with each APD. Based on the analysis of the impacts of oil and gas development on air quality and groundwater, there is not sufficient need to establish such a requirement at this time. Additionally, BLM examines each APD to insure down-hole construction standards, including casing depth requirements, are sufficient to protect groundwater.

Preparation of an Emergency Communications Plan would provide the operator, the public, and appropriate agencies information which might be helpful to prevent and/or respond to any emergencies related to oil and gas development. Much of the information to be incorporated into the plan is most likely already available. The Preferred Alternative would simply cause such information to be assembled and made available to the public and appropriate agencies.

Anvil Points Landfill LN. BLM completed an environmental assessment for gas wells within the Garfield County Landfill at Anvil Points in 1995. Garfield County purchased the landfill lands from the BLM in 1997, subject to valid, existing oil and gas leases. The U.S.

Government still owns the mineral estate and BLM, therefore, still has a role in managing the oil and gas activities. The EA described the operating agreements for future oil and gas development. All future oil and gas operations would be subject to the agreements documented in the EA.

Project Rulison Monitoring LN. Refer to Appendix E for more information concerning Project Rulison. Based on information provided in documents in this Appendix, there appears to be no risk of radioactive contamination from Project Rulison with any oil and gas development activities outside the 40 acre parcel on which Project Rulison is located. Nonetheless. It seems prudent to continue to confirm these conclusions with appropriate monitoring of new gas wells in the vicinity of the project site, given the high degree of public concern.

2.7 Management of Existing Leases

As described in the Draft SEIS, more than 95 percent of Region 4 has already been leased and those leases generally contain only standard lease terms. Though BLM has broad authority to manage oil and gas activities with the standard lease terms through the application of Conditions of Approval (COAs), BLM cannot restrict operations under the existing leases if such restrictions are not consistent with the lease rights granted. Therefore, BLM's ability to implement some of the mitigation measures contained in the Preferred Alternative is somewhat constrained unless the lease holder would accept such measures on a voluntary basis. This complication was the basis for many of the public comments received during the public review period for the Draft SEIS. Based on these comments, additional clarification is provided here on BLM's management of oil and gas activities under old leases.

The Final SEIS establishes a set of reasonable and necessary mitigation measures to be attached to all new leases and provides the AO with a more definitive set of management goals and objectives for consideration when evaluating operations on old leases. As such the Final SEIS is important and necessary for describing the context within which COAs can be developed for existing leases. For example, if the Final SEIS had placed an NSO on a Wildlife Seclusion Area, but BLM is precluded from achieving this management objective because of existing leases, then these impacts would be the basis for BLM to require some additional mitigation (rehabilitating unneeded roads, installing gates, completing habitat improvement projects, installing automated well monitoring systems, etc.) of the operator.

In order to maximize BLM's ability to achieve the mitigation measures described in the Final SEIS consistent with lease rights already granted, BLM would take the following actions for all APDs associated with existing leases:

1. Require that the operator submit a Geographic Area Proposal (GAP) that describes a minimum of two to three years activity for operator controlled federal leases within a reasonable geographic area (to be determined jointly with BLM). The GAP will be used to plan development of federal leases within the leased area to account for well locations, roads, and pipelines, and to identify cumulative environmental effects and appropriate mitigation. The extent of the analysis will be dependent on the extent of surface ownership, extent of lease holdings, topography, access and resource concerns. This requirement for a GAP might be waived for individual or small groups of exploratory wells, wells drilled in relatively undrilled areas outside the known high production zones in Region 4, or when operations are proposed along existing roads or wellpads.

2. Require the operator to conduct biological and other appropriate inventories for the affected geographic area at the direction of the BLM.

3. Consider in the environmental assessment all past as well as planned actions on federal leases within the geographic area to assess direct and indirect impacts to affected resources from oil and gas development, and describe those impacts at the geographic level described in the GAP.

4. Work with the operator to identify and consider all the mitigation measures included in the Preferred Alternative of the Final SEIS. Require all of the mitigation measures described in the Preferred Alternative that are appropriate for the GAP and are consistent with lease rights. In those cases where mitigation measures might be inconsistent with lease rights, seek voluntary compliance from the operator or develop alternative mitigation measures to accomplish the objectives of the Preferred Alternative. Continue to apply all the appropriate COAs listed in the Appendix D of the Final SEIS. Develop new COAs as appropriate to accomplish reasonable mitigation to offset the impacts described in the EA consistent with the goals established in the Preferred Alternative.

5. Use COAs to require reasonable mitigation of those wildlife habitat impacts to big game winter range attributable to past and proposed oil and gas development within the GAP area. Regarding direct impacts, BLM's overall goal is to reduce as much as practical the amount of lands on which revegetation is not possible, such as roads, production facilities, working portions of wellpads, exposed rock outcrops, highwalls, etc. In consideration of the amount and type of habitat made unavailable due to oil and gas operations, BLM will consider appropriate mitigation for such habitat losses. In some cases, increased productivity on reclaimed lands will offset some or all of the productivity lost on the lands on which revegetation is not possible. While acreage of habitat lost cannot usually be offset by acreage of habitat gains (the land base remains constant), in some instances improvements to existing habitat can make such habitat more available to certain species of wildlife. Depending on the nature and extent of the habitat lost due to oil and gas production compared to the habitat gains in the habitat improvement project area, mitigation could result in a net gain of habitat for the affected species. Such measures would generally be considered when well densities on critical winter wildlife habitats in high value wildlife areas (refer to Draft SEIS, Appendix G) exceed four wells per 640 acres or when road densities exceed three miles of road per 640 acres.

It is not BLM's intent that oil and gas operators be held accountable to mitigate habitat impacts of residential, agricultural or other commercial land uses, including those impacts associated with the Federal and State Highways and County Roads.

6. Regarding indirect habitat impacts (reduced habitat availability for big game and other species from disturbances caused by increased human activities) in big game winter range in high value wildlife areas, BLM's overall goal is to minimize indirect habitat loss by managing human activities to minimize disturbance during critical time periods by implementing measures such as road closures, hourly restrictions for well operations, use of radio telemetry or adopting a *code of conduct* for field employees such that they can perform their duties in a manner most compatible with wildlife use in the same area. Such measures would generally be considered when well density on such lands exceeds four wells per 640 acres or when road densities exceed three miles of road per 640 acres.

Chapter Three

AFFECTED ENVIRONMENT

3.1 Introduction

Chapter 3 of the FEIS described the affected environment of the GSRA. Those portions of that original affected environment description that remain accurate and sufficient are not repeated here. Those portions that require modification or more extensive information are included in this chapter. If the resource description in this document replaces, modifies or supplements the description in the original FEIS, it is so noted. If no change is needed, the reader is referred to the FEIS.

As discussed in Chapter 1, the focus of this SEIS is on Region 4 of the GSRA, the area of highest potential for oil and gas development. Within Region 4, the Production Area of the recently acquired Naval Oil Shale Reserves (NOSR) receives additional attention, as it was not included in the original EIS. That part of the NOSR north of the Production Area is not formally included in the analysis, but is included in the affected environment discussion. The remainder of the GSRA will be referenced occasionally as needed.

3.2 Climate & Air Quality

Climate. Region 4 lies along the Colorado River drainage between the communities of New Castle and DeBeque, Colorado, from east to west, and between the mountainous White River and Grand Mesa National Forests on the north and south. Because of the wide variations in elevation and topography within the study area, climatic conditions vary considerably. Along the Colorado River drainage, average daily temperatures typically range between 12 (low) and 40 (high) degrees Fahrenheit in mid-winter and between 50 (low) and 95 (high) degrees Fahrenheit in mid-summer. The frost-free period (at 32 degrees) generally occurs for 170 days between mid-April and mid-October. The annual average total precipitation is nearly twelve inches, with 30 to 40 inches of annual snowfall. Temperatures will generally be cooler, frost-free periods shorter, and both precipitation and snowfall greater at the higher elevations north and south of the Colorado River drainage.

Wind conditions will reflect channeling and mountain valley flows due to complex terrain. Nighttime cooling will enhance stable air, inhibiting air pollutant mixing and transport along the Colorado River drainage. Dispersion potential will improve farther east and west, and along the ridge and mountain tops, especially during winter-spring weather transition periods and summertime convective heating periods.

Air Quality. Although specific monitoring is not conducted throughout most of the project area, air quality conditions are likely to be very good. Air pollution emission sources are limited to a few industrial facilities, transportation emissions along the I-70 corridor, and residential emissions in the relatively small communities. Based on data provided by the Colorado Department of Public Health and Environment, Air Pollution Control Division (CDPHE-APCD; Chick 1998), particulate matter less than 10 microns in effective diameter (PM_{10}) concentrations measured at Rifle (32 $\mu g/m^3$ annual and 72 $\mu g/m^3$ second 24-hour maximum) are well below the Colorado and National Ambient Air Quality Standards of 50 $\mu g/m^3$ annual and 150 $\mu g/m^3$ 24-hour. Rural values are likely to be considerably lower. Similarly, gaseous pollutant concentrations at Rifle are assumed to be well below applicable air quality standards (carbon monoxide: ten ppm (11,430 $\mu g/m^3$) second one-hour maximum, six ppm (6,667 $\mu g/m^3$) second eight-hour maximum; nitrogen dioxide: 0.002 ppm (four $\mu g/m^3$) annual; ozone: 0.088 ppm (172 $\mu g/m^3$) annual; and sulfur dioxide: 0.012 ppm (31 $\mu g/m^3$) second three-hour maximum, 0.006 ppm

(16 μg/m^3) second 24-hour maximum, and 0.002 ppm (5 μg/m^3) annual).

Four Prevention of Significant Deterioration (PSD) Class I Areas are downwind of the project area (Flat Tops, Eagles Nest, Maroon Bells-Snowmass, and West Elk Wilderness Areas), administered by the USDA-Forest Service. Limitations on the additional amount of air pollution allowed in these areas from major emitting facilities are strict. The remainder of the project area is classified PSD Class II, as including the Holy Cross, Hunter-Frying Pan, and Raggeds Wilderness Areas, where similar but less stringent incremental pollution limits apply.

The Colorado and National Ambient Air Quality Standards set absolute upper limits to specific air pollutant concentrations at all locations where the public has access. The PSD Program is designed to limit the incremental increase (depending on the location's classification) of specific air pollutant concentrations above a legally defined "baseline" level. All NEPA analysis comparisons to the PSD Class I and II increments are intended to evaluate a "threshold of concern," and do not represent a regulatory "PSD Increment Consumption Analysis." The determination of PSD increment consumption is a regulatory agency responsibility conducted as part of the New Source Review process, which also includes a Federal Land Management Agency evaluation of potential impacts to Air Quality Related Values (AQRV) such as visibility, aquatic ecosystems, flora, fauna, etc.

Although the U.S. Environmental Protection Agency (EPA) recently revised both the ozone and particulate matter less than 2.5 microns in effective diameter ($PM_{2.5}$) Ambient Air Quality Standards, these revised limits will not be applicable until formally approved in the Colorado State Implementation Plan. Currently applicable Colorado and National Ambient Air Quality Standards, and PSD Class I and II increments are provided in Table 3.2-1.

Table 3.2-1. Air Pollutant Background, Ambient Air Quality Standards and PSD Incremental Concentrations (in μg/m^3) by Applicable Averaging Time

Pollutant/ Averaging Time	Measured at Background Concentration (a/)	Colorado & National Ambient Air Quality Standards	Incremental Increase Above Legal Baseline	
			PSD Class I	PSD Class II
Carbon monoxide (CO)				
• 1-hour	11,430	40,000	n/a	n/a
• 8-hour	6,667	10,000	n/a	n/a
Nitrogen dioxide (NO_2)				
• Annual	4	100	2.5	25
Ozone (O_3)				
• 1-hour	172	235	n/a	n/a
Particulate matter (PM_{10})				
• 24-hour	72	150	8	30
• Annual	32	50	4	17

Pollutant/ Averaging Time	Measured at Background Concentration (a/)	Colorado & National Ambient Air Quality Standards	Incremental Increase Above Legal Baseline	
			PSD Class I	PSD Class II
Sulfur dioxide (SO_2)				
• 3-hour (National)	31	1,300	25	512
• 3-hour (Colorado)	31	695	--	--
• 24-hour	16	365	5	91
• Annual	5	80	2	20

a/ *Measured background ozone concentration is an annual average; other short-term background concentrations are second-maximum measured values.*

n/a *Not applicable*

Sources: *Chick 1998; WESTAR 1995*

Potential air quality impacts from the Proposed Action and Alternatives are analyzed and reported in Section 4.2 (Environmental Consequences; Climate and Air Quality). However, the analysis is prepared solely under the requirements of NEPA, in order to assess and disclose "reasonably foreseeable" impacts to both the public and the Bureau decision maker before a "Record of Decision" is issued. Due to the preliminary nature of the NEPA air quality assessment, it should be considered a "reasonable, but conservative" upper estimate of predicted impacts. Actual impacts at the time of development may be lower.

The CDPHE-APCD is the air quality regulatory agency responsible (under their EPA-approved "State Implementation Plan") for determining potential impacts once detailed development plans have been made, subject to applicable air quality laws, regulations, standards, control measures and management practices. Therefore, the State of Colorado has the ultimate responsibility for reviewing and permitting air pollutant emission sources before they become operational.

3.3 Vegetation

The relative percentages of the different vegetative types which occur in the GSRA and their wildlife values were discussed in the 1991 FEIS (p. 3-7). This information is still valid except where it has been modified by discussions in this SEIS. The value of each vegetation type is more thoroughly explained in Section 3.5, Wildlife. The description of riparian vegetation is discussed below in 3.3.1. Updated information on Special Status Species and significant natural plant communities (referred to as Remnant Vegetation Associations in the FEIS) can be found in Section 3.6.

The geographic position of the resource area has created a high diversity of vegetation types. Using the National Hierarchical Framework of Ecological Units, the GSRA straddles the boundary of three ecological units, the Uinta Basin Section, the Tavaputs Plateau Section and the North-Central Highlands/Rocky Mountain Section.

The Uinta Basin and Tavaputs Plateau describe the area north of I-70 and west of the Grand Hogback. The rest of the Resource Area, south of I-70 and east of the Hogback, is contained within the North-Central Highlands/Rocky

Mountain Section. The Uinta Basin contains gently rolling slopes and foothills west of the Grand Hogback. The climate is arid and vegetation is predominantly piñon/juniper woodlands and salt desert scrub.

The Tavaputs Plateau describes the Roan Cliffs area west of Rifle. This ecological type is relatively rugged. It slopes gradually southward and upward until it is abruptly cut off to form a series of linear cliffs. The high plateaus have steep walled canyons. Vegetation in the Tavaputs Plateau Ecological Unit is characterized by mixed mountain shrub, mountain grasslands, aspen, Douglas fir and spruce-fir.

The third ecological unit is the North-Central Highlands/Rocky Mountain unit. This area generally includes steeply sloping to precipitous flat-topped mountains and mesas dissected by narrow stream valleys with steep gradients. Vegetation found in this unit is a mix of sagebrush steppe, piñon/juniper woodlands, oakbrush/ mixed mountain shrub, aspen, spruce-fir, Douglas-fir and meadows of grass and sedge.

3.3.1 Riparian and Wetlands

Riparian areas are the strips of land which border streams, rivers, springs, lakes, or other bodies of water. These areas are strongly influenced by water and consist of distinctive vegetative communities. Most of the riparian areas in Region 4, other than the Colorado River, are relatively narrow. The arid climate and the steep terrain limit the water-influence zone. Of the 568,548 acres of land within Region 4, there are roughly 3,525 acres of riparian vegetation, which is only 0.6 percent of the total acreage (Table 3.3.1-1). Although riparian areas typically comprise less than one percent of the area in the arid western United States, they are among the most productive and valuable of all lands.

Table 3.3.1-1 Riparian Acreage, Region 4

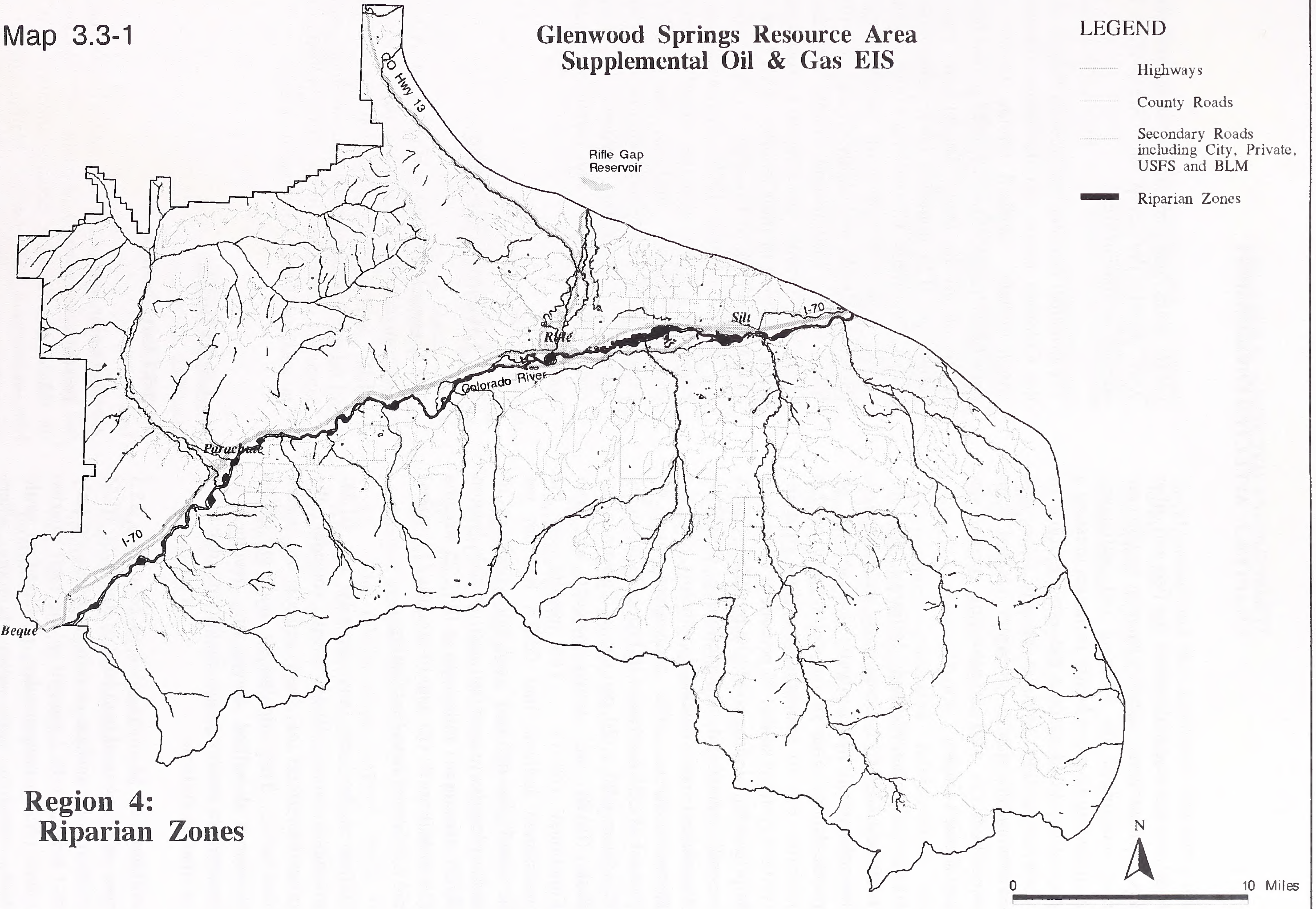
Status	Surface Acreage	Riparian Acreage
BLM	100,545	182
Production Area	11,590	10
Split Estate	50,500	113
STUDY AREA	**162,635**	**305**
NOSR	38,302	126
TOTAL BLM	**200,937**	**431**
National Forest	136,418	196
DOE	205	0
TOTAL FEDERAL	**337,560**	**627**
State	3,512	31
Private	227,476	2,867
REGION 4 TOTAL	**568,548**	**3,525**

Wetlands are a subset of riparian areas and are defined as areas that contain hydrophytic plants, hydric soils, and surface or subsurface water. This generally includes swamps, marshes, and wet meadows. Riparian and wetland areas are important for the presence of water, and the variety and structure of the vegetative community. Riparian areas usually have a greater diversity of vegetation than the surrounding uplands. In Region 4, the adjacent uplands are often devoid of trees or have only a thin stand of trees. Therefore, the riparian area with its greater variety and structure of vegetation provides nesting cover, forage, hiding cover, and corridors for movement which are often limited outside of the riparian area.

Riparian and wetland areas provide forage for domestic animals and essential food, water, cover, and nesting habitat for approximately 75 percent of our wildlife species. Over 80 percent of Colorado breeding birds are dependent on riparian areas. Where streams are perennial,

Map 3.3-1

Glenwood Springs Resource Area Supplemental Oil & Gas EIS



Region 4: Riparian Zones

they provide essential habitat for fish and other aquatic organisms. Healthy riparian systems are also recognized for filtering out sediments, contributing to groundwater recharge, creating a protective shield against the erosive force of water, extending seasonal stream flows and improving the quality of water yielded from watersheds, as well as providing recreational and scenic values.

BLM's Riparian-Wetland Initiative for the 1990's established national goals and objectives for managing riparian-wetland resources on public lands. One of the chief goals of this initiative was to maintain or restore riparian-wetland systems so that 75 percent or more were in proper functioning condition by 1997. GSRA recently completed a Functioning Condition Assessment of perennial streams in the Resource Area. The assessment rated 67 percent of GSRA streams in Proper Functioning Condition (PFC), 30 percent as Functional-at-Risk (FAR) and seven percent as Non-Functional (NOT). The results of the assessment indicate that GSRA has not yet achieved the national goal but continues to make progress toward that end. Within Region 4, 33 streams (41 miles) are in PFC, 25 streams (36 miles) are FAR, and 10 streams (11 miles) are considered Non-functioning.

Before authorizing any activity on BLM-managed lands, BLM must consider the potential effects of those actions on stream function. The stipulations and mitigation measures described herein are designed to maintain or restore proper functioning condition of riparian systems.

Although BLM managed land comprises 35.3 percent of the total land base in Region 4, BLM manages the surface or mineral estate on only 431 acres, or 12.2 percent of the total riparian areas. Early homesteaders preferred to settle along streams and valley bottoms where irrigable and ranchable lands were found. The public lands that remained after homesteading were mostly the steep, dry hills, with few streams or riparian areas.

The principal riparian resources in Region 4 are the Colorado River and the larger tributaries which include: Garfield, Divide, Beaver, and Parachute Creeks. Most of this riparian habitat occurs on private land. The primary riparian habitat on BLM managed land includes Riley Gulch, Dry Creek, Cottonwood Gulch, Wallace Creek, East Fork and East Middle Fork of Parachute Creek, and Baldy Creek. Of these, Riley Gulch, Cottonwood Gulch, and Baldy Creek have already been affected by roads along all or a portion of their lengths. East Fork and East Middle Fork of Parachute Creek are by far the most extensive BLM riparian areas in Region 4 and are also the largest remaining unaffected areas. Each of these areas is composed of a late-seral riparian vegetative community consisting largely of mature cottonwoods, willows and various herbaceous species.

3.4 Livestock Grazing

The Livestock Grazing portion of the Affected Environment was discussed on page 3-10 of the FEIS. A preliminary evaluation of the impacts of oil and gas development on livestock grazing since the publication of the FEIS indicated that no additional discussion was necessary.

3.5 Wildlife

3.5.1 Introduction

The major upland habitats and wildlife species present are discussed on pages 3-7, 3-11 and 3-12, of the FEIS. A detailed discussion of the environment of Game Management Unit (GMU) 32 is included in the "GMU 32 Wildlife

Habitat Analysis" (Broderick and Coleman, 1995), available in the GSRA office. A similar but more cursory mapping effort was also completed for GMU 42. That work is still being refined. Narrative descriptions of the GMUs are included in Appendix G.

The CDOW has mapped seasonal use areas for many species of wildlife in Colorado. This data is stored in the "Wildlife Resource Information System" (WRIS) in a Geographical Information System (GIS) and was used extensively to derive the following information for wildlife in the SEIS. Habitats referred to in the text of this document include: winter range, winter concentration areas, severe winter range, summer range, production areas, critical habitat, seclusion areas and fall concentration areas (see Chapter 7, Glossary). Critical Habitat, as defined by the CDOW, will hereafter be referred to as crucial habitat, to avoid conflict with the legal term Critical Habitat as defined by the U.S. Fish and Wildlife Service in regard to Threatened and Endangered Species.

This SEIS addresses gas development throughout the GSRA; however, most of the discussion focuses on Region 4. The FEIS addressed, in a general sense, most of the habitat types and species in the GSRA. Thus, this discussion will focus on those wildlife management species of concern that occur in Region 4 and are expected to be affected more than minimally.

3.5.2 Regional Overview

The natural environment in Region 4, especially at the lower elevations, has been radically altered over the past 30 years by development. Interstate 70 was constructed in the 1970's and bisects the Colorado River valley, effectively eliminating big game herd migration across the valley in many areas, thus forcing them to concentrate in less desirable habitat and increasing road kill mortality. Oil shale development and the associated infrastructure during the late 1970's and early 1980's eliminated thousands of acres of summer and winter range.

Gas development began to pick up pace in the early to mid-1980's and has directly impacted approximately 1,800 acres to date, but with the associated roads and traffic, has indirectly impacted over 10,000 acres. Subdivision development, associated infrastructure and recreational demands, such as increased use of off-highway vehicles, have affected even more wildlife habitat. As a result of this development activity, the importance of those habitats not yet impacted has increased.

Fire suppression over time has allowed many vegetation communities to move into late-seral condition, resulting in over-mature and decadent stands of vegetation. Noxious weeds are also becoming a greater problem throughout the area. They replace desirable forage and cover plants, and contribute to the loss of valuable wildlife habitat.

Game Management Unit Descriptions. The "GMU 32 Wildlife Habitat Analysis" provides site specific mapping of important wildlife habitat values in GMU 32. A similar but less detailed analysis has been completed for GMU 42. The GMUs were mapped using four criteria: *High Value Habitat*, *Moderate Value Habitat*, *Lesser Value Habitat* and *Seclusion Areas*. The seclusion areas fall within and may extend across boundaries of the various habitat areas. These labels are defined in the Glossary (Chapter 7) and the Habitat Areas are mapped in Appendix G.

Seclusion areas typically are relatively small habitat areas in comparison to the overall habitat. They possess unique qualities (optimum mix of quality forage, cover, and water, proximity to natural migration corridors, and presence of topographic and habitat features which moderate severe winter conditions in winter range, provide birthing areas and important summer habitat at high elevations, and/or provide security from human intrusion) and thus support higher densities and a greater diversity of wildlife species. Along with riparian areas, seclusion areas are, acre for acre, the most valuable habitat.

Region 4 includes portions of nine GMUs: 22, 23, 31, 32, 33, 42, 421, 43 and 521. The majority of public lands managed by the BLM in Region 4 occur in GMUs 31, 32, 33 and 42; however, most of the discussion will focus on GMUs 32 (north of the Colorado River) and 42 (south of the river) since most of the gas development activity in the next 20 years is expected to occur in these GMUs. The CDOW manages big game species by herd units defined as Data Analysis Units (DAUs). These DAUs are composed of one or more GMUs.

GMU 32 consists of high plateaus dissected by canyon country and dominated by the Parachute Creek drainage. Steep, exposed shale cliffs (the Roan Cliffs) separate the plateau from the lower side slopes which are characterized by dense mixed mountain shrub with pockets of Douglas fir on the north aspects, and by steep and barren to very sparsely vegetated land with low growing shrubs, forbs and some grasses. Piñon/juniper woodlands and mountain shrub dominate the mid-elevations, with sagebrush, saltbush and greasewood in the lowlands. The top of the plateau consists of rolling terrain dissected by numerous streams. Vegetation consists of a diverse mixture of mountain sagebrush, mixed mountain shrub, aspen, and spruce-fir stands. The general aspect is southerly with elevations ranging from 4,500 feet to over 9,000 feet. The most dominant feature of GMU 32 is the Roan Cliffs which extend from Rifle west to Parachute Creek and up the Parachute Creek drainage for many miles.

The NOSR Production Area is included in GMU 32 and lies east of Parachute, between the top of the Roan Cliffs and the Colorado River Valley. The Roan Cliffs support a high population of nesting raptors, including the Federally Endangered peregrine falcon. They are also thought to support at least one important bald eagle roost. Cottonwood Creek is the only significant stream occurring within the production area and it supports an important riparian area. The Roan Cliffs were mapped as a high value area and seclusion area because of its importance to nesting raptors. The Cottonwood Creek area was also mapped as a High Value Area with the upper portion being mapped as a seclusion area because of its important wildlife habitat values, including a bald eagle roost area. Most of the rest of the production area was mapped as moderate or low value because of the lower habitat quality (steep, barren slopes or desert scrub dominated by cheatgrass and other weedy species), limited free water, heavy development from the gas industry along the lower fringe and poor big game access due to Interstate 70 and lack of passage through the Roan Cliffs.

Seclusion areas in GMU 32 are relatively roadless portions of the upper reaches of the canyons, which provide an important solitude component. These canyons are typically bisected by live streams supporting a mature riparian zone. Mesic areas located on the slopes are not uncommon. The southerly and westerly aspects are typically mixed mountain shrub while the easterly and northerly aspects support conifer and aspen stands. The vegetative diversity of these areas provides excellent habitat for many wildlife species including raptors, small mammals, amphibians, reptiles, migratory passerine birds, turkey, blue grouse, chukar and big game.

Mountain lion, bobcat and black bear are likely to be found and the potential exists for bald eagle roosts and Mexican spotted owl. The southern aspects of these areas are critical as winter foraging areas for deer and elk, especially during heavy snow years. The areas also provide transition range important to mule deer, and many of these areas provide migratory corridors from the valley floor through the Roan Cliffs to the Roan Plateau, which serves as summer range for all the big game species. The seclusion areas vary in size from Cottonwood Gulch with 610 acres to Magpie Gulch with 5,097 acres. The percent of public land also varies from ten percent in Riley/Starkey Gulches to 95 percent in Magpie Gulch. The seclusion areas with a low percentage of public land generally occur in the lower reaches of drainages where public land may influence the use of private land farther up the drainage. Appendix G provides a more detailed description of each seclusion area.

GMU 42 is mountainous, extending to the divide between the Colorado River and Plateau Creek. The northern portion consists of flatter ranch land. The Battlement Range is the dominant feature along the central portion of the unit. Vegetation varies from low elevation sagebrush, farm fields and piñon/juniper stands, grading up into mixed mountain shrub, aspen and spruce-fir forests at the upper elevations. The dominant aspect is northerly. The elevation ranges from 3,000 feet to over 10,000 feet.

Seclusion areas in GMU 42 are typically located on relatively steep, rugged terrain. Two of them are mostly in the Garfield Creek State Wildlife Area. Other areas are found in Paradise Creek and Coal Ridge, outside of Region 4, and the fringe area along the north flank of Battlement Mesa. The diversity of habitat and the wildlife species using these areas is generally greater than other areas. They are typically dissected by riparian areas and often provide an important component of a species life cycle, such as a production area, winter concentration area, or crucial habitat of some type. These areas include either winter range or summer range for mule deer and elk.

Habitat Type Descriptions. Major habitat types in the Region include:

Semi-desert scrub (saltbush, sagebrush, winterfat and greasewood): This type is generally limited to the drainage bottoms from Rifle west to the GSRA boundary. This area is typically dry with relatively low forage production and low winter snowfall. It is found at the lowest elevations in the GSRA on relatively flat terrain and is usually the area most available for mule deer forage during severe winters. These areas are defined as severe winter range and crucial habitat for mule deer and elk. Little cover is provided except for small mammals and birds. Several sensitive species are associated with this habitat (see Table 3.6-1).

Juniper woodlands (juniper and piñon with an understory of serviceberry, mountain mahogany and Mormon tea): This is the most extensive type found in the GSRA. It generally occurs on the southern slopes of the lower foothills just above the semi-desert scrub and is often interspersed with the semi-desert scrub and low elevation sagebrush type. The juniper woodland habitat provides important food and cover for wintering mule deer and elk, food and cover for a variety of small mammals and birds, and is usually defined as severe winter range and crucial habitat for mule deer and elk. Several raptor species nest in the Juniper woodlands. These areas are generally arid with limited understory production unless tree canopy is fairly open.

Low elevation Sagebrush: This type also occurs at the lower elevations, is usually arid and, in the GSRA, the understory is limited. This area is very important to wintering mule deer and to a lesser degree, to wintering elk. During severe winters, mule deer diet is composed of browse species, with sagebrush the main component. It is usually defined as severe winter range and crucial habitat for mule deer and elk. Little cover is provided except for small mammals and birds. Several sensitive species are associated with this habitat (see Table 3.6-1).

Mixed mountain shrub (oakbrush, serviceberry, chokecherry, snowberry, mountain mahogany, sagebrush): This type occurs at the mid elevations and usually has a well developed understory of grasses, forbs, and sedges. Springs and mesic areas are not uncommon. This type is generally mapped as mule deer winter range and may be mapped as elk severe winter range and crucial habitat. Aspect varies but is usually northerly and occurs on moderate to steep slopes. The mixed mountain shrub type provides some nesting habitat for raptors and is very important in some areas to black bear and turkey. It is often used as fawning and calving habitat for big game.

Conifer (Douglas fir, subalpine fir, Englemann's spruce, lodgepole pine): This type is located at higher elevations, typically above 8,000 feet, and/or on northern aspects. Understory usually consists of low growing shrubs and the areas are relatively dry except for heavy winter snowpack. These areas provide important thermal and hiding cover for a variety of species and roosting and nesting habitat for a greater variety of raptors. This is usually considered summer range for big game.

Aspen (aspen, chokecherry, snowberry): This type is also located at higher elevations, typically above 8,000 feet, and/or on northern aspects. These areas are usually mesic and support a very diverse understory of grass, forbs and shrubs. They are preferred as calving areas, provide important habitat for bear during the spring months and provide nesting habitat for a large variety of raptors. These areas provide important summer food and thermal and hiding cover for big game.

Riparian/wetland/mesic (cottonwood, willow, red osier dogwood, alder, sedges, rushes, cattail): Riparian, mesic and wetland are especially important to a large variety of wildlife since they provide all the essential habitat elements and often provide the primary cover in the more desert types of habitat as well as needed water. The vegetative diversity and water associated with this habitat type supports the greatest abundance of species and numbers of wildlife, and yet it comprises less than two percent of the overall habitat in Colorado, and less than one percent of the habitat in the GSRA. It provides important nesting habitat for a variety of neotropical migratory bird species, raptors, and Merriam's turkey, as well as fawning and calving habitat.

One facet of riparian zones often overlooked is the influence they have on immediately adjacent habitat. These areas become more valuable to many species for nesting, foraging and cover due to the proximity of the riparian zone.

Cliff and talus slopes: These habitats are very limited within the GSRA. The most extensive and most important habitat of this type in the GSRA occurs on the Roan Cliffs. The Cliffs support a very high density of nesting raptors, including one known and one suspected pair of nesting peregrine falcons. Ledges and caves in this habitat type also provide important roosting sites for bats.

All of these major habitats include a variety of grasses, forbs, lichens and mosses which vary by habitat type. Each habitat type has specific importance to the species in the Region. Those values are listed in Appendix G, Table H-1.

3.5.3 Big Game

Big Game Use Areas and Movement Patterns. In the fall, most of the mule deer and elk migrate from the summer range in the high mountain meadows and forests on the Roan

Cliffs, Battlements and Uncle Bob Mountain, down through the transition range, to the lower elevation winter ranges below 8,000 feet. During the cold winter months, big game prefer the more southerly aspects where temperatures are warmer and the snow is less deep. Slopes of fifteen to 40 percent are preferred and slopes greater than 75 percent receive very little use. Vegetation communities on transition and winter ranges typically range from mixed mountain shrub and piñon/juniper in the foothills, to low elevation sagebrush and desert scrub habitats in the valleys and along the Colorado River.

The winter range is utilized from late fall until early spring, with December 1 to April 30 the most critical period for deer and elk. During mild winters, most big game are scattered throughout the winter range. However, in severe winters, due to deep snow conditions at the higher elevations, they tend to concentrate in the lowest portions of the winter range, along major drainages, typically in the sagebrush/saltbush and piñon/juniper habitats; hence the designation of these areas as severe winter range. In Region 4, the CDOW has classified severe winter range as crucial habitat. Reference Maps 3.5-1 and 3.5-2 for the use areas.

The availability of winter range is generally considered the limiting factor to big game populations in western Colorado. Winter range is also the most frequently impacted by development. For this reason, habitat quality and forage production on winter ranges dictate winter deer survival and thereby determine herd population carrying capacity. Table 3.5-1 describes winter range by land status.

Table 3.5-1 Mule Deer and Elk Winter Range In Region 4 by Land Status

STATUS	Total Surface		Deer Winter Range		Elk Winter Range	
	Acres	%	Acres	%	Acres	%
BLM	100,545	18	67,827	25	65,300	25
NOSR	38,302	7	6,055	1	2,712	1
NOSR/PROD	11,590	2	11,128	2	0	0
SPLIT ESTATE	50,500	9	23,001	8	27,343	10
TOTAL BLM	**200,937**	**35**	**108,011**	**39**	**95,355**	**36**
FOREST	136,418	24	3,726	1	24,702	9
DOE	205	0	205	0	95	0
TOTAL FEDERAL	**337,560**	**59**	**111,942**	**40**	**120,152**	**46**
STATE	3,512	[illegible]	3,352	1	3,502	1
PRIVATE	227,476	40	161,168	58	138,135	53
GRAND TOTAL	**568,548**	**100**	**276,462**	**100**	**261,789**	**100**

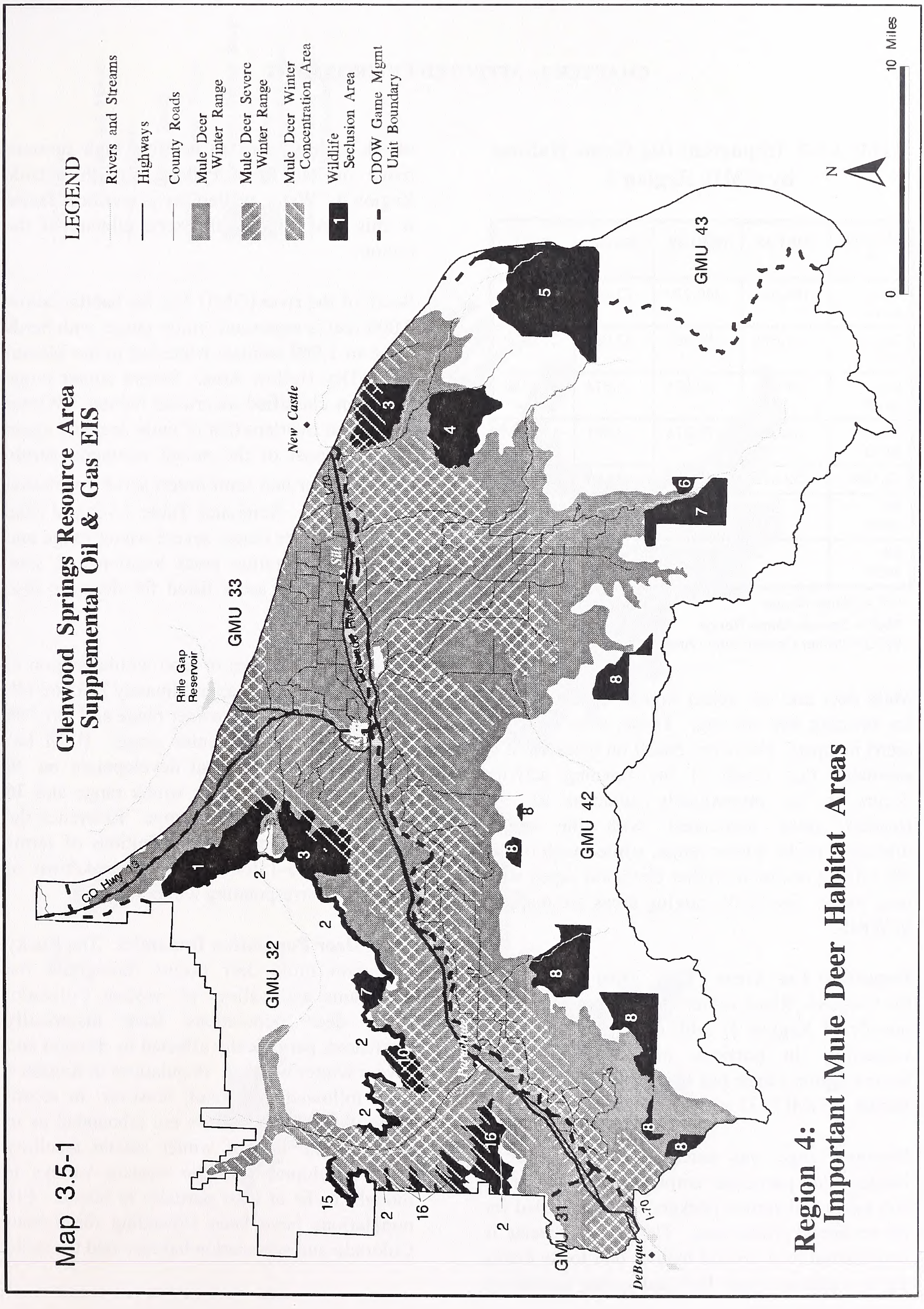
That portion of the winter range located above the severe winter range does not typically receive concentrated big game use except where winter concentration areas fall outside severe winter range. This upper elevation winter range often provides higher quality forage conditions because of better soils, more moisture, less historic livestock use and more dispersed big game use. Available, quality forage is extremely important to big game during fall and spring migrations. Most big game typically follow the snow level up in the spring, back to the summer range; however, small numbers of deer and elk may use this area year round. During the fall, quality forage assures that big game arrive on severe winter range in optimum physical condition. During the spring, quality forage is important in rebuilding the physical condition of big game, particularly for fawning and calving. Winter range also provides better opportunities for habitat improvement than severe winter range.

Important Use Areas - Deer. North of the river, GMUs 31 and 32 cover approximately 161,899 acres in Region 4, of which 87,936 acres are deer winter range, including 41,949 acres of severe winter range and 36,692 acres of winter concentration areas (Table 3.5-2). Winter concentration areas extend further up Parachute Creek while severe winter range occurs in lower elevations closer to the Colorado River and Parachute Creek (Map 3.5-1). General movement of the herd is from the summer range on the Roan Plateau, south onto winter range below the Roan Cliffs. Winter concentration area densities in this area support no less than 200 percent more deer than the surrounding winter range. Severe winter range and summer range have both been designated as crucial habitat in this area.

Based on a refined field mapping of habitat values in GMU 32 undertaken in 1995, the following areas of specific importance to deer survival in GMU 32 were identified: the Magpie Gulch - Sharrard Park area, Cottonwood Gulch, Grass Valley Mesa, Hayes Gulch, and Parachute Creek side slopes above the valley floor. See Appendix G for a more detailed description of the areas. These high value areas provide the best remaining winter habitat in the GMU. They typically consist of piñon/juniper, desert scrub and mixed mountain shrub communities which provide critical food and cover during the winter months. The riparian habitat within these areas also provides important food, cover, water and birthing areas for deer, as well as important values for a number of other species of wildlife. Portions of these areas are basically unroaded and provide seclusion values important for production and escape areas for big game. They also support higher concentrations of other wildlife species due to reduced fragmentation and disruption.

South of the river, in GMU 42, eight high value areas have been identified through a cursory review of habitat. They are the Divide Creek/Mamm Creek Basin, Sunlight Mountain/Quaker Mesa area, Uncle Bob Mountain/Alkali Creek, Van Mountain/Willow Creek, Hunter Mesa, Battlement Mesa, High Mesa/Dry Creek area and Alkali Creek/ Sunnyside area. These areas are crucial to the survival of mule deer, elk, turkey and black bear in the unit. Big game migration is primarily between summer and winter range. There is an obvious fidelity shown to the home ranges without much movement between different sections of the analysis area. Generally, the Battlement Mesa portion of the area is isolated from the rest of the range by low valleys of private lands, resulting in little movement between the Battlement Mesa area and the rest of the unit, although there is some limited movement between the Divide Creek herd and the north side of Battlement Mesa. Again, winter concentration area densities are 200 percent greater than the surrounding winter range density.

All areas defined as severe winter range have been designated as crucial habitat. "A large portion of the deer in GMU 42 winter on private land. GMU 42 is also the major unit in the DAU for production and harvest of mule deer. Winter range densities (per square mile) in GMU 42 are one of the highest in the state." (CDOW, 1996).



Map 3.5-1

Glenwood Springs Resource Area Supplemental Oil & Gas EIS

Region 4: Important Mule Deer Habitat Areas

Table 3.5-2 Important Big Game Habitat by GMU, Region 4

Region 4	GMU 32	GMU 42	Other	Total
Total acres	154,952	340,270	73,326	568,548
Deer WR	81,516	157,860	37,087	276,462
Deer SWR	37,666	69,804	9,313	116,785
Deer WCO	34,392	72,274	8,861	115,527
Elk WR	32,015	210,484	19,291	261,789
Elk SWR	0	94,269	2,978	97,247
Elk WCO	0	61,643	6,180	67,823

WR = Winter Range
SWR = Severe Winter Range
WCO = Winter Concentration Area

Mule deer and elk select higher quality habitat for fawning and calving. These areas typically aren't mapped. However, based on research, it is estimated that much of the fawning activity occurs in, or immediately adjacent to, the riparian areas associated with the major drainages in the winter range, while much of the elk calving occurs in higher elevation aspen sites near water. Some elk calving areas are mapped in WRIS.

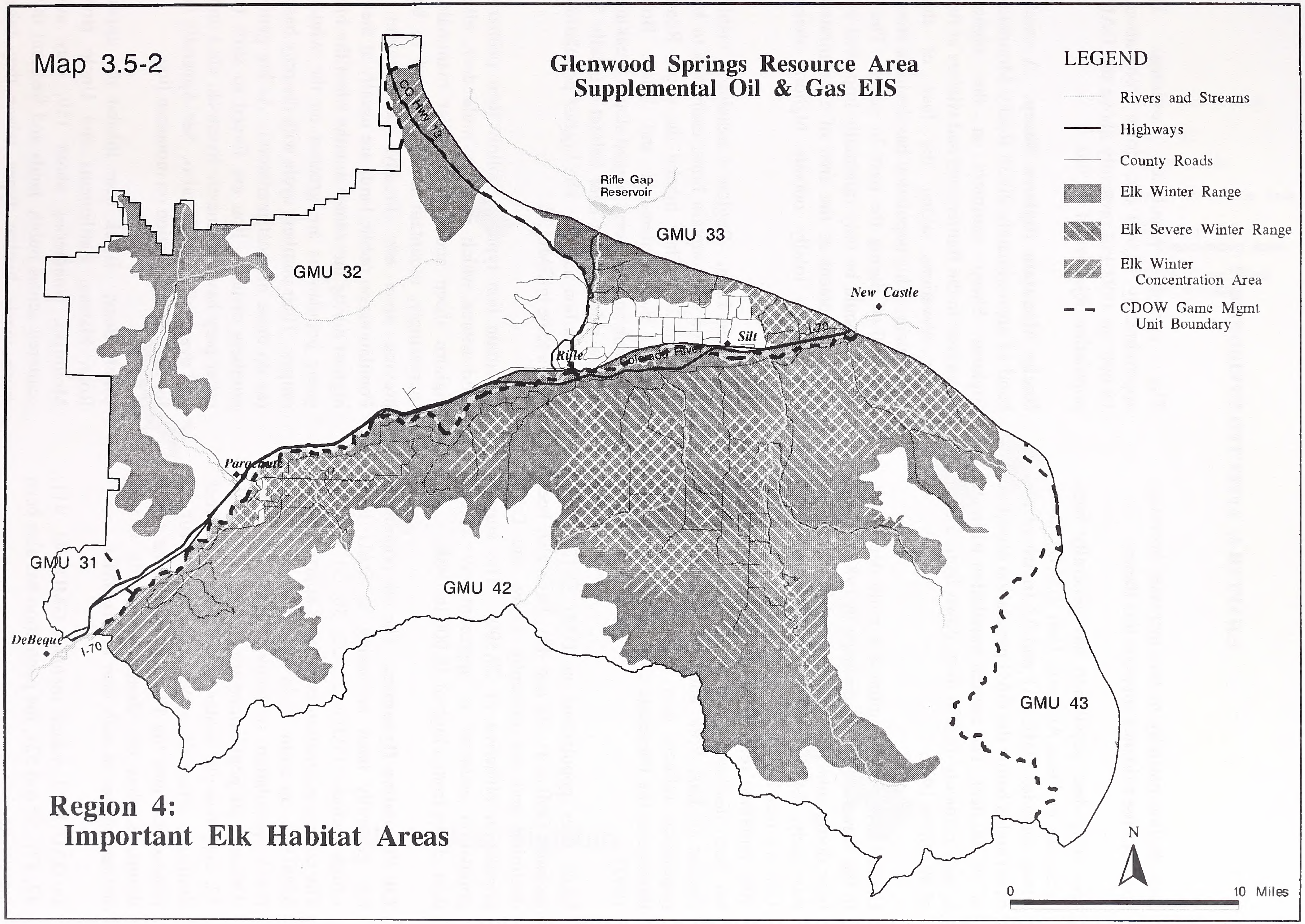
Important Use Areas - Elk. Most elk north of the Colorado River winter along Piceance Creek, outside of Region 4, with only small numbers wintering in portions of Parachute Creek. Severe winter range has been mapped as crucial habitat in GMU's 31 and 32.

Summer range was determined to be crucial habitat, with particular emphasis on water areas and aspen and spruce pockets that are needed for elk cover and production. The Roan Plateau is emphasized as a crucial habitat due to its heavy use as summer range. Fall and spring movement of elk mainly tends to be from high summer range on the Roan Plateau, north outside Region 4. Water availability is a critical factor in this DAU due to the xeric climate of the region.

South of the river (GMU 42), the habitat below 8,000 feet is important winter range, with herds of up to 1,000 animals wintering in the Mamm Creek/Dry Hollow Area. Severe winter range has been classified as crucial habitat. Winter elk habitat overlaps that of mule deer and again includes most of the mixed mountain shrub, piñon/juniper and semi-desert scrub vegetation communities. Reference Table 3.5-2 and Map 3.5-2 for winter range, severe winter range and winter concentration areas location and size. The high value areas listed for deer are also important for elk.

Of the 568,548 acres of land within Region 4, CDOW has mapped approximately 276,462 (49 percent) as mule deer winter range and 261,789 (46 percent) as elk winter range. BLM has jurisdiction over mineral development on 39 percent of the mule deer winter range and 36 percent of the elk winter range. Reference the Glossary (Chapter 7) for definitions of terms and Table 3.5-1 for a specific breakdown of acres and corresponding winter range.

Mule Deer Population Dynamics. The Rocky Mountain mule deer occurs throughout the mountains and valleys of western Colorado. Mule deer populations have historically fluctuated, periodically affected by drought and severe winter weather. Populations in Region 4 have followed that trend; however, in recent years, their numbers have not rebounded as in the past and loss of winter habitat resulting from development in the western valleys is thought to be at least partially to blame. Elk populations have been expanding throughout Colorado and speculation has also tied the mule



Map 3.5-2

Glenwood Springs Resource Area
Supplemental Oil & Gas EIS

Region 4:
Important Elk Habitat Areas

deer decline partially to this increase; however, no definitive evidence supports this theory.

The mule deer population has generally been declining in Data Analysis Unit (DAU) D-41, which includes GMUs 31 and 32 (north of the river) and is below the DAU population objective of 16,700 deer. The current population estimate is approximately 16,000 deer, down from a high of 49,000 in 1961.

Unocal Corporation initiated a mule deer study in the Parachute Creek drainage in 1982 and has been doing annual surveys since then. Based on this study, the mule deer population peaked in 1987 (a recovery from the 1983-84 winter die off), remained relatively steady until 1990 and has been declining since then. The mule deer decline in East Fork and their continued low population reflects deer population dynamics throughout the Parachute Creek drainage (Grant, 1997).

Mule deer populations in DAU D-12 which includes GMUs 41, 42 and 421, have also been declining and are presently below the DAU population objective of 29,500. The current population estimate is approximately 26,200 deer, down from a high of 38,000 in 1988.

Elk Population Dynamics. The elk population has generally been increasing in DAU E-10 which includes GMUs 21, 22, 30, 31 and 32. The current population estimate is approximately 6,000 elk, up from 75 in 1972 and double the DAU population objective of 3,000 elk. Although elk populations are increasing in GMU 32, very few elk winter in the Parachute Creek drainage. Most elk move north or west off the plateau top into the Piceance and Roan Creek drainages, thus elk should have only a very limited impact on mule deer in this GMU.

In DAU E-14, which includes GMUs 41, 411, 42, 421, 52 and 521, the population has also been increasing. The current population estimate is approximately 12,000 elk, down from about 18,000 in 1992 but presently above the DAU population objective of 10,500.

Rocky Mountain Bighorn Sheep. A small band of approximately 20-30 Rocky Mountain Bighorn Sheep summers at the higher elevations in the Battlements and winters at the lower elevations along the face of the Battlements. This population has declined from about 50-60 during the past 20 years. Their habitat should be only minimally impacted by gas development as the area of concentrated activity lies totally outside bighorn sheep range.

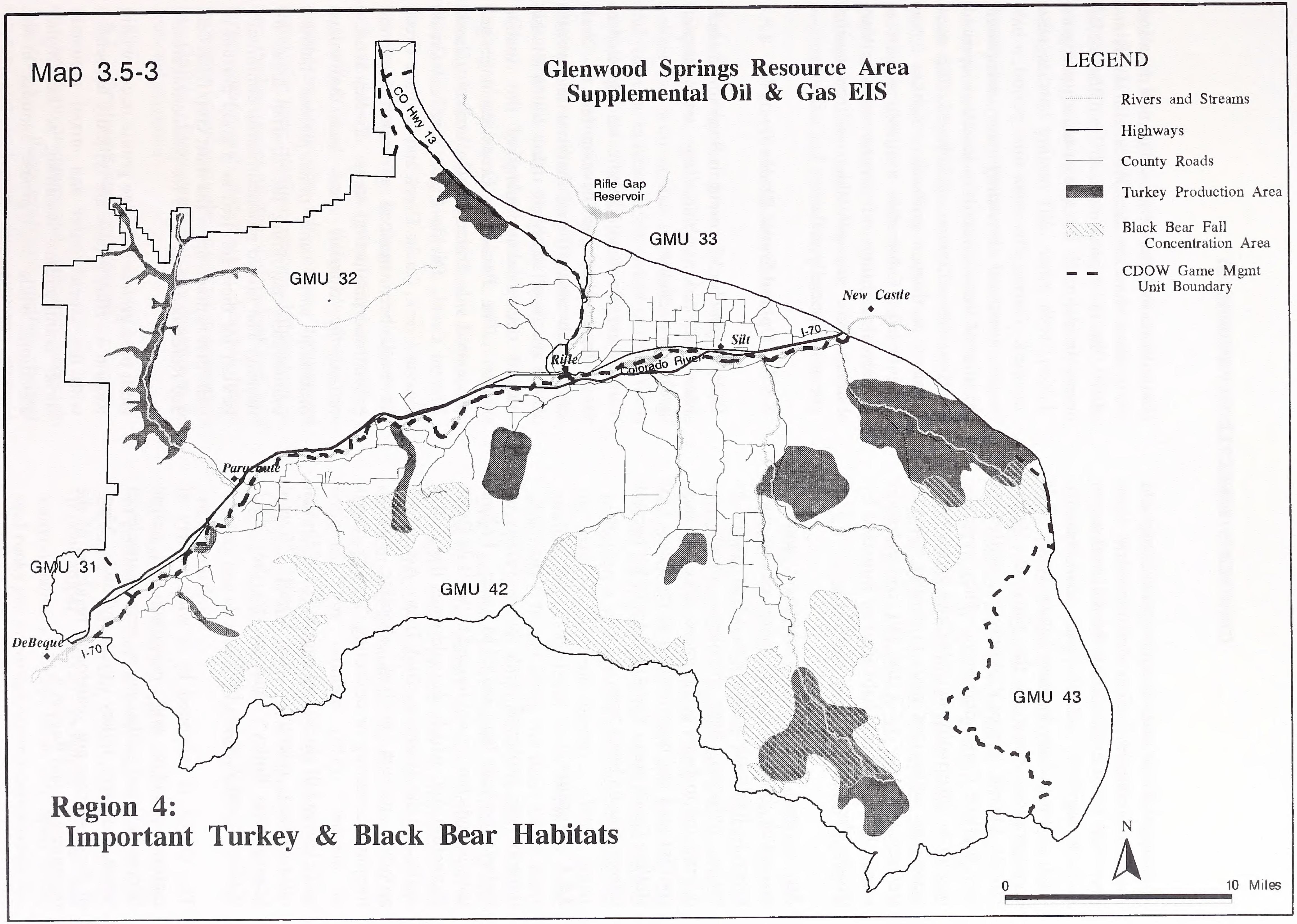
Mountain Lion. Region 4 sustains a viable population of mountain lions, estimated to be less than 30. They inhabit the upper Roan Plateau, the Battlements and Uncle Bob Mountain and the steep, rugged slopes breaking off the sides. Mule deer habitat typically is mountain lion habitat. The biggest population seems to be in GMU 32.

Mountain lion typically follow their primary food source which includes mule deer, elk, bighorn sheep and other smaller mammals. Increasingly, mountain lion are found to be preying upon elk (Freddy, pers. comm.). Populations on public lands are usually at their highest during the winter months when the big game populations are greatest on the winter ranges. Their numbers cycle with the prey base (as do those of most predators). As big game numbers dwindle, lion are forced to shift to other prey bases (domestic livestock, etc.) and will eventually dwindle also. See Appendix G for harvest information on mountain lion.

Black Bear. Black bear inhabit the upper Roan Plateau, Battlements and Uncle Bob Mountain. Numbering about 150, they are scattered across public lands and frequent the more mesic habitat types where they take

Map 3.5-3

Glenwood Springs Resource Area Supplemental Oil & Gas EIS



Region 4: Important Turkey & Black Bear Habitats

advantage of the extensive mountain shrub and aspen communities. They are dependent upon mast and berry crops during the fall and aspen buds during the spring, and consequently tend to concentrate in these habitat types. Fall concentrations occur in the Garfield, Baldy, Divide, Mamm, Spruce, Cottonwood, Battlement and Wallace Creek drainages. They typically den up for hibernation in rocky/talus areas, small caves and under root wads in conifer habitats. Reference Map 3.5-3 for fall concentration areas, the most likely habitat to be impacted by gas development.

An increase in human development and the associated food and garbage increases can cause bears to habituate to humans. This results in major nuisance bear problems which are detrimental to bears and humans alike. A bear conflict area has been mapped in the lower Dry Hollow Creek area. See Appendix G for harvest information on black bear.

3.5.4 Raptors

Raptors are protected both by a variety of Federal and State laws and BLM policy. Federal laws include but are not limited to the Bald Eagle Protection Act, which also addresses the golden eagle, and the Migratory Bird Treaty Act, which prohibits pursuit, hunting, shooting, killing, trapping, capturing or collecting "by any means or manner." (This includes any disruption sufficient to kill chicks and eggs.) For additional information, reference the Draft "Raptor Management Policy" handbook for the GSRA (Coleman and Wunder, 1995).

The GSRA is inhabited by a wide variety of raptors, including both peregrine and prairie falcon, bald and golden eagles, several species of buteo, accipiters, turkey vulture and owls. Many of these species are year-round residents of the resource area and Region 4.

Only three inventories of raptor nest locations have been done in the GSRA. In 1978 and 1979, the most prominent cliffs in the GSRA were inventoried for presence of peregrine falcon, with other cliff nesting species nests mapped. During this same time period, a bald eagle roost/nest inventory was completed. Neither of these inventories has been repeated. During the summers of 1994-96, the most likely northern goshawk habitat was inventoried. Other data available consist of incidental sightings of raptor nests. Very limited data are available on tree nesting species, especially owls.

3.5.5 Upland Game Birds

Upland gamebirds present in Region 4 include Merriam's turkey, blue, sage and sharptail grouse, and chukar.

Turkey are the most likely to be impacted to any degree by gas development. Their production areas (brood habitat) and winter areas are most likely at risk. Much of this habitat occurs along many of the riparian zones. The Parachute Creek drainage and associated side drainages, Government Creek, Mamm Creek, Divide Creek, Garfield Creek, Beaver Creek, Cache Creek and Wallace Creek have all been mapped as important winter habitat and production areas. Turkey tend to utilize the riparian areas and the mixed mountain shrub and piñon/juniper habitats immediately adjoining the riparian areas for nesting. The mixed mountain shrub community is vital for their survival as a good portion of their diet is made up of the mast crop from oak. See Reference Map 3.5-3 for production areas.

Both blue grouse and sage grouse occur within Region 4. Blue grouse are typically associated with the aspen/conifer and mixed mountain shrub communities occurring at the higher elevations while sage grouse summer in the sagebrush uplands and historically have wintered in the low elevation sagebrush areas along the Colorado River. Neither species is likely to be greatly impacted as a result of gas development in Region 4.

Small chukar populations can be found north of the river, on the steep slope and talus areas of the Roan Cliffs, especially around Smith and Kelly Gulch and within the Parachute Creek drainage, predominantly in Wheeler Gulch. Their populations are low and thought to be dwindling throughout this area. Riparian areas provide nesting habitat and needed free water.

3.5.6 Waterfowl and Shorebirds

Waterfowl occurring in Region 4 include: Canada geese, mallards, teal, mergansers and golden eye, with smaller populations of gadwall and widgeon, to name a few. Most of these birds extensively use the Colorado River, Fravert Reservoir and many of the gravel pits along the Colorado River, including the Parachute Ponds State Wildlife Area. Waterfowl typically nest in willow and grass/shrub understory. Outside Region 4, major waterfowl use areas are the Roaring Fork, Colorado and Eagle Rivers, and the reservoirs on King Mountain.

Shorebirds occurring in Region 4 include the great blue heron, egrets (great, cattle and snowy) and white faced ibis. Great blue heron are dependent upon the tall mature cottonwood stands for their platform nests and they feed in the shallow water in the Colorado River and larger ponds and reservoirs. Several heron rookeries occur along the major river systems in the GSRA. Egrets and ibis are thought to be seasonal migrants.

3.5.7 Predators and Furbearers

A variety of predators and furbearers occurs in Region 4. Representatives include bobcat, coyote, red and gray fox, marten, raccoon, badger, skunks, ringtail, beaver, mink, muskrat and weasels. Bobcat and ringtail are most commonly found in the rocky, broken terrain of foothills and canyonlands. Preferred habitats are piñon/juniper woodlands and montane forests. They can be found throughout the area of concentrated development in Region 4. Their prey in this area generally consists of rabbits, squirrels, mice, small birds, deer and prairie dogs. Appendix G includes additional information on predators and furbearers.

3.5.8 Small Game and Non-game Species

A large variety of non-game wildlife also occurs, including mountain and desert cottontail rabbits, snowshoe hare, blacktail and whitetail jackrabbits, ground and rock squirrels, mice, voles, songbirds, and others too numerous to mention. They can generally be found inhabiting all of the habitats represented in Region 4 with species and numbers varying by habitat type and quality. White-tailed prairie dog complexes exist west of Una alongside I-70 and along the Roan Cliffs from Hayes Gulch to Cottonwood Gulch. Other small populations are found elsewhere in the GSRA. The extent of these complexes is currently undetermined and no inventory has been done to determine the presence of co-existent species such as the burrowing owl or ferruginous hawk.

A large variety of songbirds, including both indigenous and neotropical migratory species, occurs within Region 4, with the greatest variety and abundance typically associated with riparian habitat.

In western Colorado, reptiles occur in a variety of ecosystems, but are most common in the low elevation sagebrush, semi-desert scrub, piñon/juniper, mixed mountain shrub and canyon habitats. Deep, loose soil, open areas, and rocks are important habitat components for reptiles in the region. At least six snake, eight lizard, and six amphibian species can be found in Region 4. In general, amphibians are limited to mesic areas (streams, ponds, drainages), occurring most often in riparian, wetland and irrigated agricultural areas. In Region 4, stock ponds, numerous gravel pits along the Colorado River, Fravert Reservoir, the Parachute Ponds and most of the streams support a variety of amphibians.

3.6 Special Status Species

An overview of Special Status species in the Glenwood Springs Resource Area is presented in Chapter 3, Pages 3-6 and 3-12 of the FEIS. All listed, candidate and sensitive species are collectively referred to as "special status" species. Table 3.6-1 provides a current list of species and their legal designations. A discussion of significant natural plant communities that may also be given special management designation is also included in this section.

The Endangered Species Act of 1973 and its amendments require Federal agencies to insure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of the critical habitat of the species. Federal agencies shall also use their authorities in furtherance of the purposes of the Endangered Species Act, which is to restore threatened and endangered species to the point where the Endangered Species Act is no longer necessary. The term "endangered species" means any species which is in danger of extinction throughout all or a significant portion of its range. The term "threatened species" means any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Candidate species are those species for which the USFWS has sufficient data to list as threatened or endangered, but for which proposed rules have not yet been issued. Although candidate species are not protected under the Act, it is BLM policy to:

> *"carry out management, consistent with the principles of multiple use, for the conservation of candidate species and their habitats and to ensure that actions authorized, funded, or carried out do not contribute to the need to list any of these species as T/E." (BLM Manual 6840, 1988)*

Furthermore, BLM State Directors may designate sensitive species. By definition, this designation includes species that could easily become endangered or extinct in a State. Therefore, the protection provided by the policy for candidate species is used as the minimum level of protection for sensitive species. Currently, the Colorado BLM has a sensitive plant list. A revision of that list is underway with the addition of a sensitive animal list.

Significant natural plant communities (SNPCs) are natural plant communities that: 1) are globally rare; 2) are rare within the state; or 3) have not been substantially altered by human activity. The first two categories include vegetative communities in which the individual component species may not be rare, but the unique combination of plant species is rare or uncommon. The third category of SNPCs involves plant community types that are significant not because of their rarity, but because they represent relatively undisturbed natural communities with few non-native species.

SNPCs on BLM lands are important for many of the same reasons that special status plants are important. Urbanization, agriculture, and other human activities have greatly altered many of the natural plant communities on private land. Public lands are therefore critical to maintaining the diversity of natural plant communities and biological diversity in general (BLM, F&W 2000, 1992). SNPCs constitute relict areas and may serve as comparison areas to assess public land health and analyze the impacts of human activities. These areas may also be important for future scientific research.

Roads or other surface disturbance lessen the value of SNPCs as reference areas because surface disturbances interrupt the natural processes at work and often serve as conduits for the invasion of noxious weeds and other non-native species.

The USFWS identifies eleven Federally listed endangered or threatened wildlife or plant species that could potentially occur in Region 4 (Appendix M). These are the black-footed ferret, peregrine falcon, bald eagle, whooping crane, Mexican spotted owl, Southwestern willow flycatcher, razorback sucker, Colorado squawfish, humpback chub, bonytail chub and Uinta Basin hookless cactus. In addition, the USFWS indicates two candidate species that are known to occur in Region 4. These are the boreal toad and Parachute beardtongue. BLM has also identified potential habitat within Region 4 for one threatened plant, the Piceance twinpod, and one candidate plant, the Debeque phacelia.

Table 3.6-1 lists all the special status species that were included on the USFWS list, or are either known to occur or have the potential to occur in Region 4. Of these, eight species are listed as Endangered and four species are currently listed as Threatened under the Endangered Species Act; three are candidates for listing as either Threatened or Endangered. The remaining species are considered BLM Sensitive species.

The majority of the sensitive species listed in the table are associated with dry sites with shallow soils, cliffs and rock outcrops and the juniper and desert scrub communities commonly found along the base of the Roan Cliffs, along the Colorado River and Parachute Creek drainage. The Production Area includes a considerable amount of these types of habitat, and several of these species are known to occur there.

In the Glenwood Springs Resource Area, the only areas which have been inventoried for significant natural plant communities are the former NOSR-1 and portions of the Colorado River riparian corridor. An inventory of the Roaring Fork watershed was initiated in 1997 and will continue in 1998. Subsequent inventories of the rest of the Resource Area may discover other SNPCs of concern.

Key to Table 3.6.1: Species Status as Listed in Column 3

FE	Federally listed as endangered
FT	Federally listed as threatened
FC	Federal listed as a candidate species
FC (w)	Federal candidate species warranted for listing
SE	State listed as endangered
ST	State listed as threatened
SC	State listed as species of special concern (no legal status)
BLMS	Colorado BLM Sensitive
FS	Forest Service Sensitive

Table 3.6-1 Special Status Species in the GSRA

Scientific Name	Common Name	Status	Habitat	Probability of Occurrence on BLM
PLANTS				
Astragalus debequaeus	Debeque milkvetch	BLMS	Varicolored, fine textured, seleniferous or saline soils of Wasatch Formation- Atwell Gulch Member; 5100-6400 ft.	Definite
Astragalus naturitensis	Naturita milkvetch	BLMS	Sandstone mesas, ledges, crevices and slopes in piñon/juniper woodlands; 5000-7000 ft.	Likely
Lesquerella parviflora	Piceance bladderpod	BLMS	Shale outcrops of the Green River Formation, on ledges and slopes of canyons in open areas; 6200-8600 ft.	Likely
Mentzelia (Nuttallia) argillosa	Arapien stickleaf	BLMS	Steep, eroding talus slopes of shale, Green River Formation; 5800-9000 ft.	Definite
Penstemon debilis	Parachute penstemon	FC	Sparsely vegetated, south facing, steep, white shale talus of the Parachute Creek Member of the Green River Formation; 8000-9000 ft.	Definite
Penstemon harringtonii	Harrington's beardtongue	BLMS	Open sagebrush or less commonly, piñon/ juniper habitats. Soils are typically rocky loams and rocky clay loams derived from coarse cal-cereous parent materials (basalt); 6800-9200 ft.	Definite
Phacelia submutica	Debeque phacelia	FC	Sparsely vegetated, steep slopes in chocolate-brown or gray clay on Atwell Gulch and Shire Members, Wasatch Formation. Soils often have large cracks because of the high shrink-swell potential of the clays; 4700-6200 ft.	Likely
Physaria obcordata	Piceance twinpod	FT	Barren white outcrops and steep slopes exposed by creek downcutting. Parachute Creek Member of the Green River Formation: 5900-7800 ft.	Unlikely
Sclerocactus glaucus	Uinta Basin hookless cactus	FT	Rocky hills, mesa slopes, and alluvial benches in desert shrub communities; 4500-6000 ft.	Definite
Spiranthes diluvialis	Ute's ladies-tresses	FT	Sub-irrigated alluvial soils along streams, and in open meadows in floodplains; 4500-6800 ft.	Likely
MAMMALS				
Canis lupus	Gray wolf	FE, SE	Plains, forest, and tundra. Extirpated from Colorado?	Unlikely
Corynorhinus townsendii pallescens	Townsends (western) big eared bat	BLMS, FS	Roosts and hibernates usually in caves and abandoned mines; however, may roost in old buildings, tunnels and bridges. Typically feeds	Definite

Scientific Name	Common Name	Status	Habitat	Probability of Occurrence on BLM
			along riparian habitat, open areas, edge habitats	
Eudorma maculatum	Spotted Bat	BLMS, FS	Ponderosa pine, piñon/juniper woodland and shrub desert. Prefers areas with cliffs and water. Old buildings, feeds in open habitat. Canyons.	Likely
Gulo gulo luscus	North American Wolverine	SE, BLMS, FS	Preferred habitat includes boreal forests, tundra and large tracts of dense mountain forests broken by meadows and marshy areas undisturbed by roads and humans. Home ranges may comprise more than 200 square miles. Only one positive and one probable sighting have ever been made in GSRA. No breeding habitat on BLM but possible migrant.	Unlikely
Idionycteris phyllotis	Allen's bat (Mexican) big-eared	BLMS, FS	Associated with montane forests, piñon/juniper woodland, shrubland and riparian cottonwood. Prefers caves, mines and similar sheltesr for day roosts.	Unlikely
Lutra canadensis sonorae	Southwest river otter	SE	Inhabit riparian areas along permanent water of relatively high quality and with abundant food base.	Likely
Lynx canadensis	Canada lynx	FT, SE	Habitat suitable to support viable populations of lynx is thought to consist of 15-25 square mile areas of contiguous Spruce-fir and/or lodgepole pine forests occurring on slopes of less than 30 percent.	Unlikely
Mustela nigripes	Black-footed ferret	FE, SE	Occupies prairie dog towns almost exclusively. Prairie dog prey base in the GSRA unlikely to be large enough to support breeding population.	Unlikely
Myotis thysanodes	Fringed myotis	BLMS, FS	Coniferous forest and woodland. Ponderosa pine, piñon/juniper, greasewood, saltbush and oak. Roosts in rock crevices, caves abandoned mines and buildings and trees. Hibernates in caves and buildings.	Likely
Myotis yumanensis	Yuma myotis	BLMS	Dry, shrubby country but tied closely to water. Piñon/juniper woodland and riparian woodland in semidesert valleys. Roosts in caves, crevices or abandoned mines and buildings. Forages over water, along streams, over springs, among shoreline or riparian vegetation.	Likely
Nyctinomops macrotis	Big free-tailed bat	BLMS	Roosts and hunts in canyon and rock outcrops	Likely
Ursus arctos	Grizzly bear	BLMS, FS	Prairie grasslands to alpine tundra. Extirpated from the State?	Unlikely

Scientific Name	Common Name	Status	Habitat	Probability of Occurrence on BLM
BIRDS				
Accipiter gentilis	Northern goshawk	BLMS, FS	Breeding: mixed, often mostly coniferous, forest, open woodland typically in mature aspen, mixed aspen/conifer and in lodgepole pine. Nest in crotch or by trunk, occasionally in aspen.	Definite
Athene cunicularia	Western burrowing owl	ST	Breeding: grassland, prairie,savanna, open areas near human habitation. Nests in burrows, often associated with prairie dog towns.	Likely
Bucephala islandica	Barrow's goldeneye	BLMS, SC	Breeding: near densely vegetated lakes and ponds with abundant aquatic vegetation. Seasonal migrant.	Definite
Buteo regalis	Ferruginous hawk	BLMS, FS, SC	Breeding: open country (prairies, plains, badlands). Nests in tree with commanding view, on ground, bank, butte or slope. Historic and seasonal migrants.	Definite
Centrocercus minimus	Gunnison sage grouse	BLMS, SC	Breeding in sagebrush, nests under sagebrush.	Unlikely
Centrocercus urophasianus	Sage grouse	BLMS, SC	Breeding in sagebrush, nests under sagebrush.	Definite
Charadrius alexandrinus nivosus	Western snowy plover	BLMS, SC	Breeding in beaches and dry mud or salt flats; sand margins of rivers, lakes, and ponds.	Likely
Empidomax trailli extimus	Southwestern willow flycatcher	FE, SE, FS	Breeding: willow (and tamarisk) thickets along rivers and streams. Nests in upright or slanting fork. Colorado River, west of Rifle, CO	Likely
Falco peregrinus anatum	American peregrine falcon	FE	Nests in high cliffs and hunts along riparian zones, especially the Colorado river and uplands above the Roan cliffs.	Definite
Grus americana	Whooping crane	FE, SE	Seasonal migrant with sandhill cranes	Definite
Grus canadensis tabida	Greater sandhill crane	ST, BLMS	Breeding in shallow wetlands, freshwater margins. Nests on ground, requires surrounding water or undisturbed habitat. Seasonal migrant.	Definite
Haliaeetus leucocephalus	Bald eagle	FT, ST	Nests in tall trees (typically mature cottonwood in this area) along the Colorado River and hunts along the river and adjacent uplands. Seasonal migrant/historic resident.	Definite
Plegadis chihi	White faced ibis	BLMS	Breeds in marsh, swamps, ponds, rivers - mostly freshwater; nests in aquatic vegetation, usually on ground but occasionally in shrubs or	Definite

Scientific Name	Common Name	Status	Habitat	Probability of Occurrence on BLM
			low trees. May be seasonal migrant.	
Strix occidentalis	Mexican spotted owl	FT, ST	Breeding: in dense old growth conifer (esp. old growth fir) and deciduous (especially in steep walled canyons). Nests in cliffs and abandoned platform nests of raven, eagle and hawks.	Unlikely
Tympanchus phasianellus columbianus	Columbian sharptailed grouse	SE, BLMS FS	Breeding in grassland, savanna, partially cleared boreal forest, shrubland, sagebrush. Leks usually occur on small knolls. Nests in small depression in grass or under a shrub. May be a seasonal migrant.	Definite
FISH				
Catostomus discobolus	Bluehead sucker	BLMS, SC	Colorado River Basin	Definite
Catostomas latipinnis	Flannelmouth sucker	BLMS, SC	Colorado River Basin	Definite
Gila cypha	Humpback chub	FE, ST	Critical habitat-Colo. River-Ruby Canyon west (not in GSRA)	Unlikely
Gila elegans	Bonytail chub	FE, SE	Critical habitat-Colo. River-Ruby Canyon west (not in GSRA)	Unlikely
Gila robusta	Roundtail chub	BLMS, SC	Colorado River Basin	Definite
Oncorhynchus clarki pleuriticus	Colorado River cutthroat trout	BLMS, FS SC	Colorado River Basin	Definite
Ptychocheilus lucius	Colorado squawfish	FE, ST	Critical habitat – Colorado River-Rifle west	Unlikely
Xyrauchen texanus	Razorback sucker	FE, SE	Critical habitat – Colorado River-Rifle west	Definite
REPTILES				
Crotalus viridis concolor	Midget faded rattlesnake	BLMS, SC	Desert scrub, rocky outcrops, canyonlands	Definite
Lampropeltis trianguhim taylori	Utah milk snake	BLMS	Grasslands, sandhills, canyons and ponderosa pine, piñon/juniper woodland, and arid river valleys	Definite
AMPHIBIANS				
Bufo boreas boreas	Boreal toad	FC (w), SE	Wetlands	Definite
Rana pipiens	Northern leopard frog	BLMS, FS, SC	Wetlands, ponds, riparian areas	Definite
Spea intermontanus	Great Basin	BLMS, SC	Piñon/juniper, sagebrush, semidesert shrub,	Definite

Scientific Name	Common Name	Status	Habitat	Probability of Occurrence on BLM
	spadefoot		dry rocky slopes and canyons	

3.6.1 Special Status Plants

The FEIS discussed only four of the BLM Special Status plants: Parachute beardtongue, Harrington's beardtongue, Debeque phacelia, and Uinta Basin hookless cactus. These were the Federally threatened and candidate species known to occur in the Resource Area at that time. The FEIS did not include the BLM Sensitive plants and those plants that were not known to occur in GSRA at the time. Subsequent projects and inventories have discovered new populations and expanded the range of rare plant species within GSRA. Most of these species are concentrated in the western half of Region 4, north of I-70. Five of these species are endemic to the Green River Shale geologic formation. This formation is limited to the Piceance Basin/Roan Plateau of Colorado and the Uinta Basin of Utah. Of the Special Status plant species, Parachute beardtongue has the narrowest habitat range; it is only known to occur within Region 4.

NOSR (including the Production Area). The variability of elevation, topography and aspect which exists on the NOSR, combined with the unusual geology, has resulted in a great diversity of plant community types. The NOSR supports several unique natural plant communities and a high concentration of rare species.

For the relatively small size of the geographic area, the NOSR is extremely species rich. There are only three other areas of comparable size in western Colorado that contain such a richness of rare species. The other three areas include two National Monuments and a National Park. Although the NOSR is clearly of comparable biological significance, it is the only area of the four that does not enjoy protective status such as that afforded to National Parks or Monuments. (CNHP Report, 1997.)

Previous surveys of the NOSR Production Area (1993-1995) did not include all the possible special status plants in the area and inventoried less than 9,000 of the 12,000 acres. Another NOSR survey (1995-1996) did not include any NOSR lands below the rim.

Uinta Basin hookless cactus (Sclerocactus glaucus) is listed as a Threatened species by USFWS. The Uinta Basin hookless cactus is distributed in four counties in western Colorado and in portions of eastern Utah. This species has been found in the extreme western portion of Region 4. Although widely distributed compared to the other rare plants listed below, the individual populations are usually small.

Piceance twinpod (Physaria obcordata) is listed as a Threatened Species by USFWS. This plant has an extremely narrow distribution and is currently found only in Rio Blanco County. However, similar habitat exists in the NOSR.

Parachute beardtongue (Penstemon debilis) appears to be one of the rarest plants in the world. It occurs on steep south-facing talus slopes of the Parachute Creek Member of the Green River Formation. The Parachute beardtongue is a Candidate species for listing under the ESA. It has not been listed yet because the species was only recently discovered and until now the threats to the population have been minimal. In the summer of 1996-7, the Colorado Natural Heritage Program (CNHP) conducted a search of much of its potential habitat and succeeded in locating only two new occurrences in close proximity to an already known population. Late in summer of 1997, an additional population was discovered below Anvil Points. This brings the total number of known populations to five, all in Region 4.

Debeque phacelia (Phacelia submutica) is also a Candidate for listing under the ESA. This tiny annual plant has a much narrower distribution than the Federally-listed Threatened species, Uinta Basin hookless cactus. Known populations are centered around Debeque in Garfield and Mesa Counties. This species is known to occur less than one mile west of Region 4 and some potential habitat exists in Region 4.

Arapien stickleaf (Mentzelia argillosa) is found on steep eroding talus slopes of the Green River Formation in eastern Utah and in Garfield County. It is already known to occur on the NOSR, but more potential habitat remains to be searched. This plant is a BLM Sensitive species.

Debeque milkvetch (Astragalus debequaeus) is concentrated within a five mile radius west and south of Debeque in Garfield and Mesa Counties. A disjunct population occurs in the foothills below Anvil Points. This population represents the easternmost extent of its known range and is a good, healthy population. CNHP conducted a status review (reinventory) of the population in the summer of 1997 and found only two or three new occurrences of the species.

Harrington's beardtongue (Penstemon harringtonii) is a BLM Sensitive species. Harrington's beardtongue is currently known from five counties in west central Colorado and was recently discovered in the Beaver and Porcupine Creek drainages in Region 4. This plant is locally abundant within the GSRA but is globally rare and the threats to the species are considered high.

Piceance bladderpod (Lesquerella parviflora) is locally abundant but not widely distributed. The Piceance bladderpod is found on shale outcrops of the Parachute Creek Member of the Green River Formation in Garfield, Mesa and Rio Blanco Counties. Several populations exist in Garfield County just west of Region 4 and one population was found on the Battlement Mesa cliffs at the southern edge of Garfield County.

3.6.2 Special Status Wildlife Species

The FEIS discussed only four of the BLM Special Status Wildlife species for the GSRA: bald eagle, peregrine falcon, razorback sucker and Colorado River cutthroat trout. These were the Federally endangered and candidate species known to occur in the Resource Area at that time. The FEIS did not include the BLM Sensitive species and those species that were not known to occur in GSRA at the time. Subsequent projects, inventories and access to data from the CNHP have brought to light new populations and expanded the range of rare wildlife species within GSRA.

NOSR (including the Production Area). The Roan Cliffs provide excellent nesting habitat for a variety of raptors, including the peregrine falcon. Nesting density on these cliffs is one of the highest in the GSRA. Douglas fir stands below the cliffs also appear to provide winter roost sites for the bald eagle. The head of Cottonwood Creek provides one site (Grant, pers. comm.) and although no inventory has been done, casual observations would indicate that other roosts may exist elsewhere in this area.

The dry, rocky habitats below the cliffs are also known to support a variety of reptiles, including the sensitive **midget faded rattlesnake** (Crotalus viridis concolor).

American peregrine falcon (Falco peregrinus anatum) has been documented nesting along the Roan Cliffs near the Anvil Points area since 1991. Reports of peregrine falcons are documented as early as 1972 (*TRW March 1981*).

Bald eagle (Haliaeetus leucocephalus) roosts are also thought to occur in the Cottonwood Gulch and in some conifer stands located high along the Roan Cliffs north of the Colorado River (Val Grant, personal communication).

Remaining portion of Region 4 and the GSRA.

American peregrine falcon (Falco peregrinus anatum) sightings have also occurred throughout Region 4 over the years but to date, no other nest sites have been confirmed. One recent sighting of a pair in the West Fork of Parachute Creek may indicate an as yet unlocated nest in that area (Val Grant, personal communication). They tend to hunt the uplands above the Roan Cliffs and the riparian areas along the Colorado River and Parachute Creek drainage, as well as the major drainages south of the Colorado river. Another active nest is located on the Colorado River north of Dotsero. Other sightings have been made, but no nests documented.

Southwest willow flycatcher (Empidonax traillii extimus) range has been defined with the Colorado River as its northernmost boundary. Wallace Creek was defined as potential habitat; however, surveys have revealed no southwestern flycatchers occupying that habitat at the present time. This is the only area that has been surveyed.

Black-footed ferret (Mustela nigripes) is not known to occur in the GSRA. It is associated with prairie dog towns of several hundred acres in size and those prairie dog towns in the GSRA are typically less than 100 acres in size and widely scattered.

Whooping Crane (Grus americana) and **Greater sandhill crane** (Grus canadensis tabida) are both known to migrate through the GSRA but, to date, no nesting has been observed; however, one or more sandhill cranes summered in the Castle Peak area in 1995.

Southwest river otter (Lutra canadensis sonorae) has been sighted in the Colorado River in the GSRA; however, population sizes and locations are currently undetermined.

Bald eagles (Haliaeetus leucocephalus) were historic residents of this area. An historic nest is located in a ponderosa pine along the Roaring Fork River near Cattle Creek and another in a mature cottonwood, along the Colorado River near Webster Hill. Other nests have been constructed over the last 20 years between Rifle and Silt, west of Rifle along the Colorado River, and near the mouth of Cottonwood, in mature cottonwood stands. They also built a nest in the West Fork of Parachute Creek uplands in the fall of 1994 (John Broderick, personal communication).

Currently, bald eagles winter in the Colorado River basin, usually arriving around mid-October and departing around mid-March. During this period, they hunt across the uplands adjacent to the river and the riparian areas along the river and other side drainages flowing into the river. Bald eagles tend to use communal roosts in mature trees, protected from the elements. A number of winter roosts are located in mature cottonwood stands along the Colorado River. Although not mapped, a roost is also thought to occur in the East Fork of Parachute Creek (Val Grant, personal communication). Roost sites are also located along the Roaring Fork River in the mature cottonwood and in a Douglas fir stand above Glenwood Springs. No roosts have been documented on the upper Colorado River but perch sites are located along it, as well as along the Eagle River and Brush Creek.

Mexican spotted owl (Strix occidentalis) has not been recorded in the GSRA; however, potential habitat exists in the Roan Cliffs area, especially in the side canyons up Parachute Creek and in Glenwood Canyon.

Columbian sharptailed grouse (Tympanchus phasianellus columbianus) have been recorded in the NOSR, including the upper elevations of the Production Area in the mixed mountain shrub and sagebrush uplands. They are uncommon throughout the state of Colorado and are listed by the State as endangered and by the BLM as a sensitive species.

Northern goshawk (Accipiter gentilis) is a rare to uncommon resident in this area. Several nests have been located in the GSRA (Castle Peak, Black Mountain, King Mountain, Hack Lake, and Hardscrabble area). In Region 4, nests have been located in the June Creek area and in the Mamm and Alkali Creek areas on USFS lands. The June Creek area and the NOSR are the only two areas in Region 4 that have been surveyed by the BLM. Goshawks also are known to winter along the Grand Hogback.

Ferruginous hawk (Buteo regalis) historically occurred in Region 4 and there are several recorded nests in the Debeque area and west; however, there are currently no documented nests in Region 4.

Barrows goldeneye (Bucephala islandica) is most likely a winter migrant. It has been sighted along the Colorado River; however, there are no recorded nests.

Gunnison sage grouse (Centrocercus minimus) are thought to have historically occurred in the GSRA, at least south of the Eagle and Colorado Rivers. No grouse located in the area south of the aforementioned rivers have been captured in order to determine subspecies; however, evidence of sage grouse is noted almost annually in this area.

Sage Grouse (Centrocercus urophasianus). The northern species of sage grouse historically occurred throughout the GSRA. Remnant populations still occur in Eagle and Routt counties and suitable habitat still exists in Region 4, although sage grouse populations in Region 4 are very small, if they still exist.

Western burrowing owl (Athene cunicularia hypugea) have been documented on Onion Ridge during the fall, most likely as a seasonal migrant (Gene Byrne, personal communication). No surveys have been done to document their presence in the GSRA; however, prairie dog colonies do exist in Region 4 in the Una area and below the Roan Cliffs. They do exist in the Grand Junction Resource Area.

White-faced ibis (Plegadis chihi) have been documented throughout the GSRA, usually along the Colorado River and Brush Creek; however, no nests have been documented to date.

Yuma myotis (Myotis yumanensis), **long-legged myotis** (Myotis volans), **fringed myotis** (Myotis thysanodes), **Townsends big eared bat** (Plecotus townsendii pallescens), and **spotted bat** (Eudorma maculatum), along with several non-sensitive species, have been documented in the GSRA. There are three recorded caves in Region 4 near Anvil Points, and the Anvil Points mine and several other cave shafts along the Roan Cliffs may provide suitable habitat. In addition, there are ample overhangs, ledges and other suitable habitat within the Region. A large number of caves exist along the edge of the Flattops in the limestone formations. They serve as roost areas and, at least historically, some have served as hibernation areas. These caves, although poorly inventoried, are known to support a diverse range of sensitive bat species. Most mines with any length to them appear to provide at least roosting habitat and those sampled have housed several species of bat although complete inventories have not been done.

Colorado Squawfish (Ptychocheilus lucius), the **razorback sucker** (Xyrauchen texanus), the **humpback chub** (Gila cypha) and the **bonytail chub** (Gila elegans) all have critical habitat designations by the USFWS. For the former two species this habitat extends from Rifle westward, and for the latter two, the habitat extends from Black Rocks in Ruby Canyon, west (outside the GSRA). The bonytail chub is thought to have been extirpated from Colorado. The Colorado squawfish is known to occur below the dams in Debeque Canyon and once the new fish ladders are constructed, will likely extend its range up river into the GSRA. The razorback sucker has been found in gravel pits at Webster Hill and at the head of Debeque Canyon in gravel pits.

Midget faded rattlesnake (Crotalus viridis concolor), **Utah milk snake** (Lampropeltis triangulum taylori are both known to occur in Region 4. Populations of midget faded rattlesnake are uncommon, but have been found from south of Silt, west to at least Rulison, and from north of Rifle, west to Parachute and up Parachute Creek. They are usually located near rock outcrops in the foothills below the Roan Cliffs.

Boreal western toad (Bufo boreas boreas), **Northern leopard frog** (Rana pipiens), and **Great Basin spadefoot** (Spea intermontanus) can all be found in Region 4 in a variety of locations.

3.7 Wild Horses

The Wild Horses portion of the Affected Environment was discussed on page 3-17 of the FEIS. There are no managed populations of wild horses in the GSRA and they are not discussed in this document.

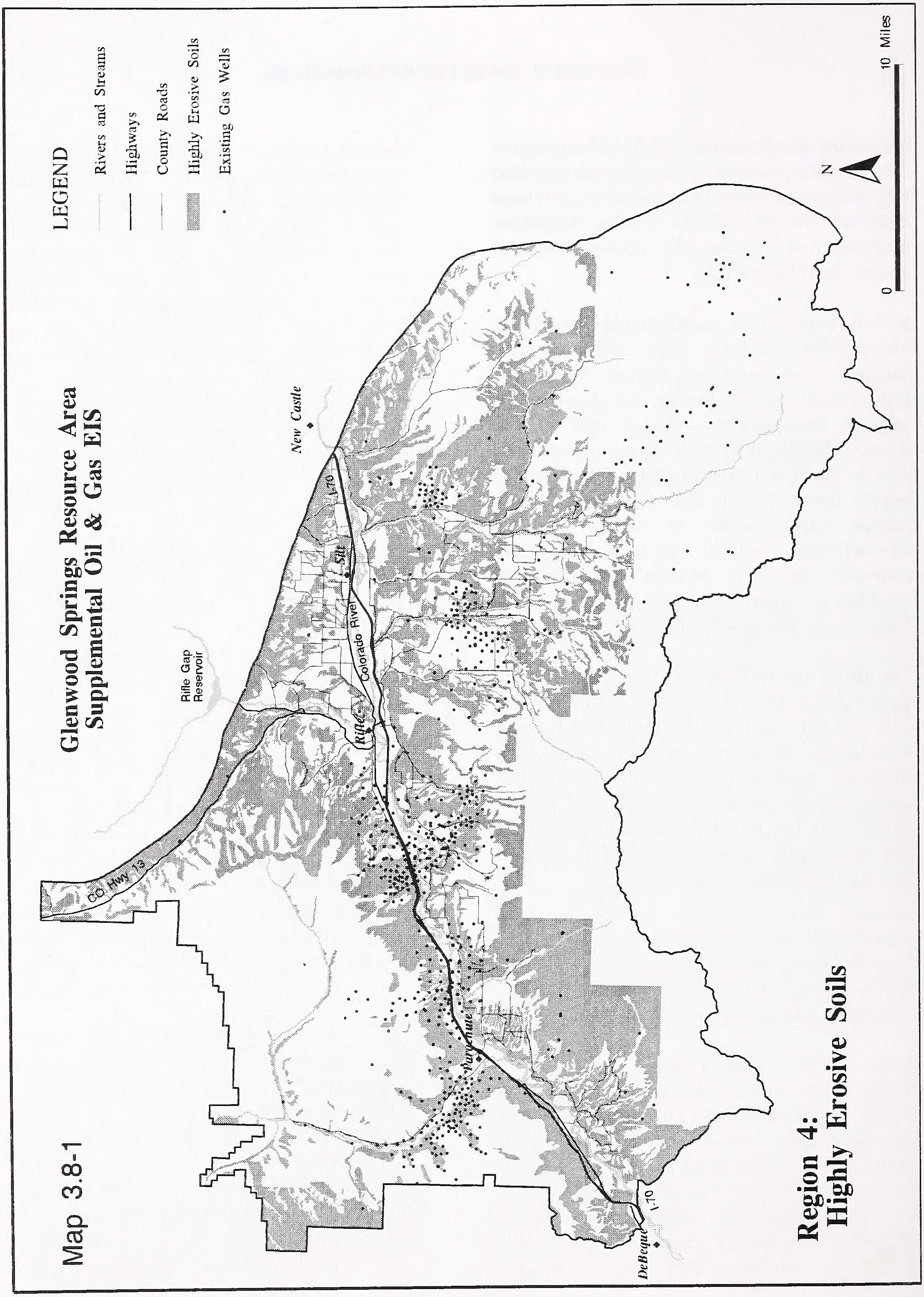
3.8 Soils

The GSRA encompasses terrain in western Colorado with great topographic relief. The topography often varies from mountains over 10,000 feet to deeply incised river valleys at 5,000 to 6,000 feet elevation in a short horizontal distance. Precipitation and vegetation also vary greatly. Since soil development is a function of parent material, topography, climate, time, and living organisms, soil patterns are complex. Public land in the GSRA is often located on side slopes and in the uplands with highly variable soils. Region 4 is characterized by numerous rock outcrop escarpments and alluvial/colluvial depositional areas where slopes flatten in the valley bottoms. These rock outcrops and depositional areas also add complexity to the more general soil pattern.

In Region 4, highly erosive soils are often encountered on the steep slopes of the Roan Plateau north of the Colorado River and on the steep slopes of Battlement Mesa south of Parachute. For this SEIS, highly erosive soils are defined as having an erosion rating of severe or very severe. These soil erosion ratings are derived from the Natural Resource Conservation Service (NRCS) Level 3 Soil Surveys, which are incorporated into the BLM's GIS data base. The numeric erosion rates for the various mapped soil associations were then correlated with an earlier NRCS Erosion Condition mapping that included the numeric rates of erosion used in this SEIS.

Soils in Region 4 are separated into four erosion classes for this analysis. These classes are Low, Medium, Severe and Very Severe. Soil in the Low erosion class erodes at a rate of one to two tons of soil/acre/year; soils in the Medium erosion class erode at two to five tons/acre/year, soils in the Severe erosion class erode at five to twelve tons/acre/year; and soils in the Very Severe class erode at twelve to 30 tons/acre/year. All of the erosion rates are estimates for soil erosion under natural conditions. Areas with soils rated Severe or Very Severe are considered highly erosive.

The listed erosion rates are values designed to show relative amount of natural soil movement. This soil movement may be movement as small as a fraction of an inch to movement of great distances. Soil erosion is a natural process that takes place on all land surfaces. Soil erosion should only be viewed as detrimental when the rate of erosion decreases site productivity or when water quality is degraded.



Map 3.8-1

Glenwood Springs Resource Area Supplemental Oil & Gas EIS

Region 4: Highly Erosive Soils

The GSRA 1984 RMP designated several areas with a disproportionate amount of public land with highly erosive soils as Erosion Hazard Zones. Soils in these areas would require special management consideration when surface disturbing activities are proposed. Only one of the designated Erosion Hazard Zones, the Center Mountain/Divide Creek area, is in Region 4.

The NOSR property includes land on the Roan Plateau where soils are often deep, well drained with moderate slopes, and experience a moderate rate of soil erosion. However, highly erosive soils are commonly found on the steep south-facing slopes of the Roan Plateau within the NOSR production area. Soils in this area are highly varied, shallow to deep, usually well drained, generally lacking vegetative cover, often on steep terrain, and often highly erosive.

3.9 Water

This section supplements the discussion of surface and groundwater in the FEIS on Pages 3-17 and 3-18.

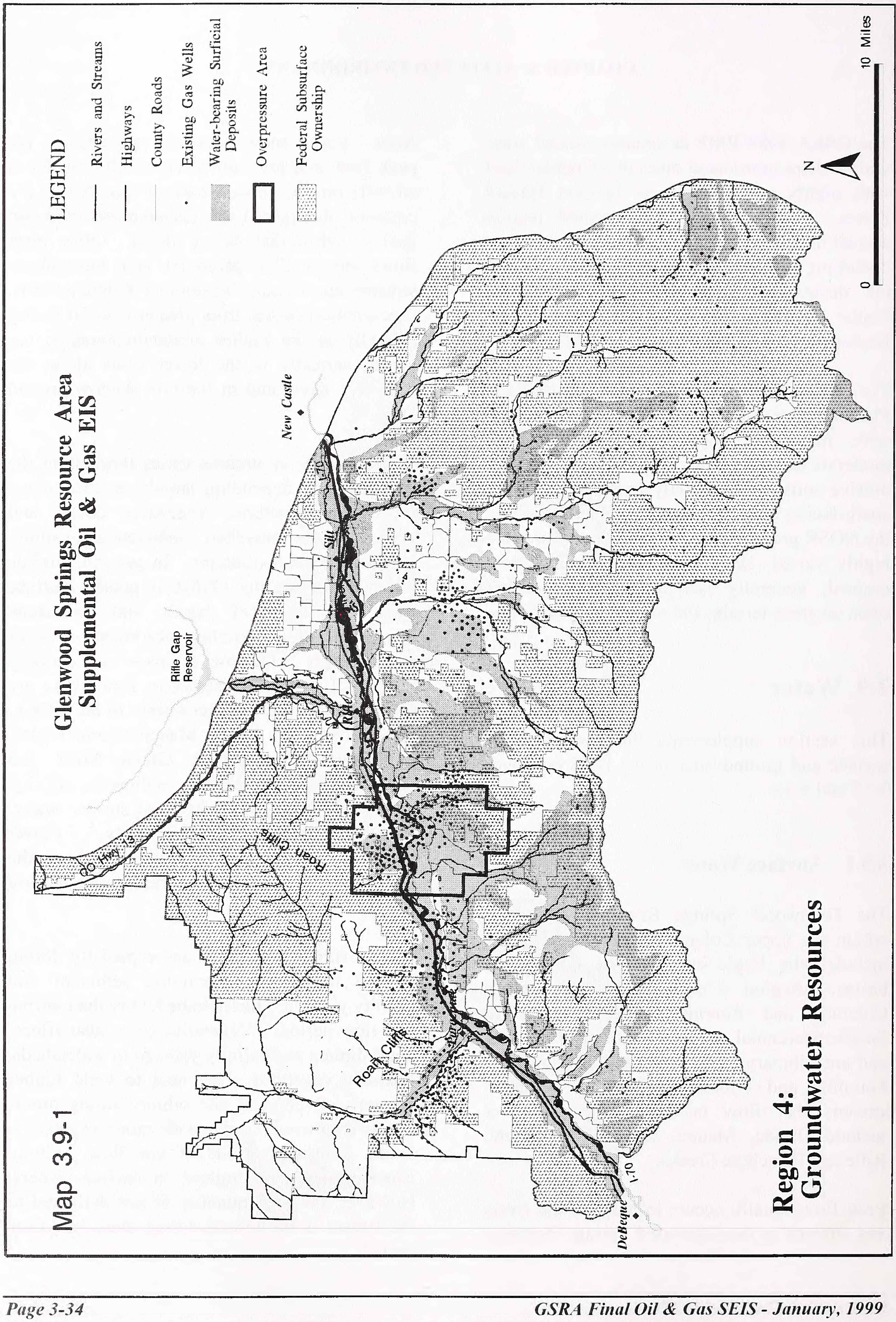
3.9.1 Surface Water

The Glenwood Springs Resource Area lies within the upper Colorado River drainage and includes the Eagle and Roaring Fork River basins. Region 4 encompasses part of the Colorado and Roaring Fork River basins. Smaller perennial streams that drain Region 4 and are tributary to the Roaring Fork River are Fourmile and Thompson Creeks. Perennial streams that flow into the Colorado River include Divide, Mamm, Beaver, Battlement, Rifle and Parachute Creeks.

Peak flow usually occurs in May on the rivers and streams in the Glenwood Springs Resource Area. Large snow pack typically delays the peak flow and low snowpack usually results in an early runoff. Intense summer cloudbursts are common throughout the resource area and can lead to substantial stream flows. Often peak flows on smaller perennial and intermittent streams are a result of summer thunderstorms. Precipitation ranges from greater than 30 inches annually in the higher mountain areas to ten inches annually in the lower areas along the Colorado River and in the rain shadow around Dotsero.

Water quality in streams varies throughout the resource area depending largely on the annual precipitation patterns, vegetative cover, and geology of the watershed. Sediment and salinity are the primary pollutants. In general, surface water quality in the GSRA is good. Surface water in areas of basalt and sandstone formations are a calcium bicarbonate type of good quality with low sediment and salinity yields. Basalt and sandstone formations are often located in the higher terrain in the GSRA. Formations such as the Mancos/Pierre shales, Eagle Valley Evaporite, Green River and Morrison tend to increase sediment, salinity, sulfate and magnesium levels of surface water, thereby decreasing water quality. Lower portions of many watersheds throughout the GSRA have extensive areas with these formations.

During snow melt runoff and especially during intense thunderstorm activity, sediment and salinity yields are likely to be higher than during low flow periods. Vegetative cover also affects the sediment and salinity yield from watersheds. Sparsely vegetated areas tend to yield higher amounts of sediment and salinity during runoff events than would areas with more vegetative cover. During periods of low flow, salinity concentrations are highest in surface waters. However, the total quantity of salt delivered to the stream is the lowest during these low flow periods.



Map 3.9-1

Glenwood Springs Resource Area Supplemental Oil & Gas EIS

Region 4: Groundwater Resources

The GSRA RMP designated watersheds that have characteristics requiring special management considerations to protect water quality. These RMP designations are Water Quality Management Areas, Municipal Watersheds and Debris Flow Hazard Zones. Most of the designated watershed areas have low potential for oil and gas development. Only two of these designated watersheds are in Region 4. These two designated areas are the Divide Creek/Center Mountain Water Quality Management Area and the Rifle Municipal Watershed south of Rifle in the Beaver Creek drainage. Oil and gas development has already taken place in both of these watershed areas with no known water quality problems resulting.

As mentioned above, sediment and salt yields are the major pollutants contributed to surface water. Sediment yield from public land is estimated at one-quarter ton to 8.4 tons/acre/year and would average an estimated one ton/acre/year in the GSRA (BLM, 1991). At this rate, the estimated total sediment yield contributed to surface water from public land in the GSRA would be 566,000 tons/year. An estimated 57,000 tons of salt are added to the Colorado River annually by runoff from BLM lands in the GSRA. While this may seem like a considerable amount, it is dwarfed by the estimated 500,000 tons of salt that are contributed annually to the Colorado River from hot springs between Dotsero and New Castle, (BLM, 1984). The Dotsero Hot Springs alone contributes 55,000 tons of salt per year.

Two important factors affecting the amount of sediment and salinity contributed to surface water are the proximity of disturbance to a stream and the maintenance of the vegetative cover between the disturbance and the stream. Maintenance of riparian vegetation is especially important in the protection of water quality because of these factors. Riparian vegetation functions to armor stream banks and is a filter which helps settle sediment from water before it gets into the stream.

3.9.2 Groundwater

Much of the public land consists of outcrops of the Uinta, Green River and Wasatch Formations. The Green River and Uinta outcrop on the higher elevation area north and south of the Colorado River (Roan Plateau and Battlement Mesa Area), while the underlying Wasatch Formation is exposed elsewhere. The Mesaverde Formation outcrops along the Divide Creek Anticline (mostly USFS lands). Although there may be some minor water zones within the Wasatch, the Wasatch consists of clay, shale and lenticular sandstones and does not generally contain usable water zones. The Mesaverde, which underlies the Wasatch, consists of numerous lenticular sandstones but, except for the Divide Creek area, the formation is generally too deep for drilling domestic wells.

In the Divide Creek area, large quantities of water have been produced from the dewatering of the coal bed methane wells at a depth of about 3,600 feet from the lower Mesaverde. This water is pumped from the coal beds prior to the extraction of the natural gas resource. Because the water is salty in nature, it is injected into the underlying Cozzette and Corcoran Sandstones, which have even lower water quality. No data are available for any shallower water zones in the upper Mesaverde.

The Roan Plateau area of the NOSR, located north of the Colorado River, consists of the Green River and Uinta Formations. Based on spring inventory data, the Parachute Creek member of the Green River and the Uinta Formation contains usable water-bearing zones. Water quality for the upper Uinta water zone tends to be good, while the lower Parachute Creek water zone generally is of poorer quality. The area below the Roan Cliffs and the NOSR Production Area consists of the Wasatch and the lower part of the Green River Formation. These formations are not known to contain significant usable water zones. Hydrologic information from the Garfield County landfill studies indicate that there are no usable water zones within the landfill area.

The hydrogeology on BLM-administered lands within the planning area generally is different from that of private lands in that public lands tend to have less exposures of shallow water bearing surficial deposits. Most of the public lands do not include the stream and river corridors and consequently have fewer alluvial aquifers. The only BLM, Forest Service, or split estate lands with significant surficial deposits are located in the Beaver and Porcupine Creeks, Battlement Mesa, Flatiron and High Mesa areas. Accordingly, there are few water wells located on public lands.

Based on water quality and physical characteristics data obtained from the numerous wells drilled throughout the region, there appear to be multiple aquifers which are not necessarily connected, rather than one continuous regional aquifer. The recharge for these wells appears to be from the Battlement Mesa mountainous area and the other higher elevation areas along the southern portion of the planning area and from the Roan Plateau area to the north.

There are over 300 known domestic water wells within Region 4. Most are located on private lands within the Rulison, Grand Valley, Parachute, Mamm Creek, Beaver Creek, Porcupine Creek, Divide Creek areas and the NOSR Production Area. Some of the water wells are located in the vicinity of producing gas wells, mostly on private lands. About half of the wells are less than 100 feet deep and generally intersect the alluvial aquifers along the Colorado River, Parachute Creek and the other streams and tributaries throughout the area. The deeper wells range in depth from about 100 to 250 feet, with a few in excess of 400 feet. These are generally located on the slopes and benches south of the Colorado River. The aquifers for these deeper wells appear to be water zones within the unconsolidated surficial deposits, such as the colluvium, talus, landslide or terrace material which overlay the Wasatch Formation.

A water quality sampling of 111 water wells between New Castle and DeBeque and in the Collbran area was conducted during the Summer of 1997 (Water Well Sampling Report for the Piceance Basin of Western Colorado, Greystone, Sept 1997). The results show various levels of the following in the samples: iron, hydrogen sulfide, sodium, potassium, calcium, magnesium, manganese, alkalinity, TDS (total dissolved solids) and low levels of methane. A summary of the evaluation states that several samples exceeded either the Human Health Standards or the Secondary Drinking Water Standards for chloride, iron, fluoride, pH and sulfates. The BTEX (benzene, toluene, ethyl benzene and xylene) concentrations were found to be below the State of Colorado remedial action levels. Low methane (background) concentrations (less than 0.4 milligrams per liter) were reported in eleven of the sampling locations. There is no established drinking water threshold standard for methane.

Overall, no obvious correlation between depths and particular results were noted in the report. Generally, background water quality appears to be variable because of differences in geology, mineralogy, rock types, formations, depths, proximity to recharge areas and aquifer characteristics.

3.10 Forestry

This discussion supplements the Forestry Affected Environment section in the FEIS on pages 3-18 and 3-19.

Within the GSRA, the predominant forest type is piñon/juniper woodlands covering about 215,000 acres. Commercial forest lands comprise about 48,000 acres supporting the spruce-fir, lodgepole pine, Douglas fir, aspen and Ponderosa pine forests.

Piñon/juniper woodlands are found at elevations ranging from 4,500 to 8,000 feet. Woodland products harvested include commercial and public-use fuel wood, fence posts and transplants. Harvest of piñon/juniper has decreased 50 to 65 percent since the mid-1980's because of decreased wood-burning to reduce air quality impacts in mountain communities. Most wood fiber use is limited to fuelwood sales averaging less than 500 cords per year of piñon/juniper. Approximately 40 percent (200 cords) of the annual fuelwood harvest can be attributed to personal home-heating use.

The forest resource is generally healthy, although many forest stands are in mature or over-mature condition. Over time, with continued forest management practices, the overall health of the forest resource is likely to remain in satisfactory condition. The piñon/juniper woodland type is comprised of stands in all age classes and conditions, but is generally typified by slow-growing mature stands.

Within Region 4, piñon/juniper and oak woodlands comprise the forested area below 8,000 feet elevation. Aspen is the primary forest type on the Roan Cliffs with subalpine fir and Douglas-fir growing on north-facing slopes.

3.11 Recreation

This section supplements the discussion of the Recreation Affected Environment on pages 3-20 and 3-21 of the FEIS.

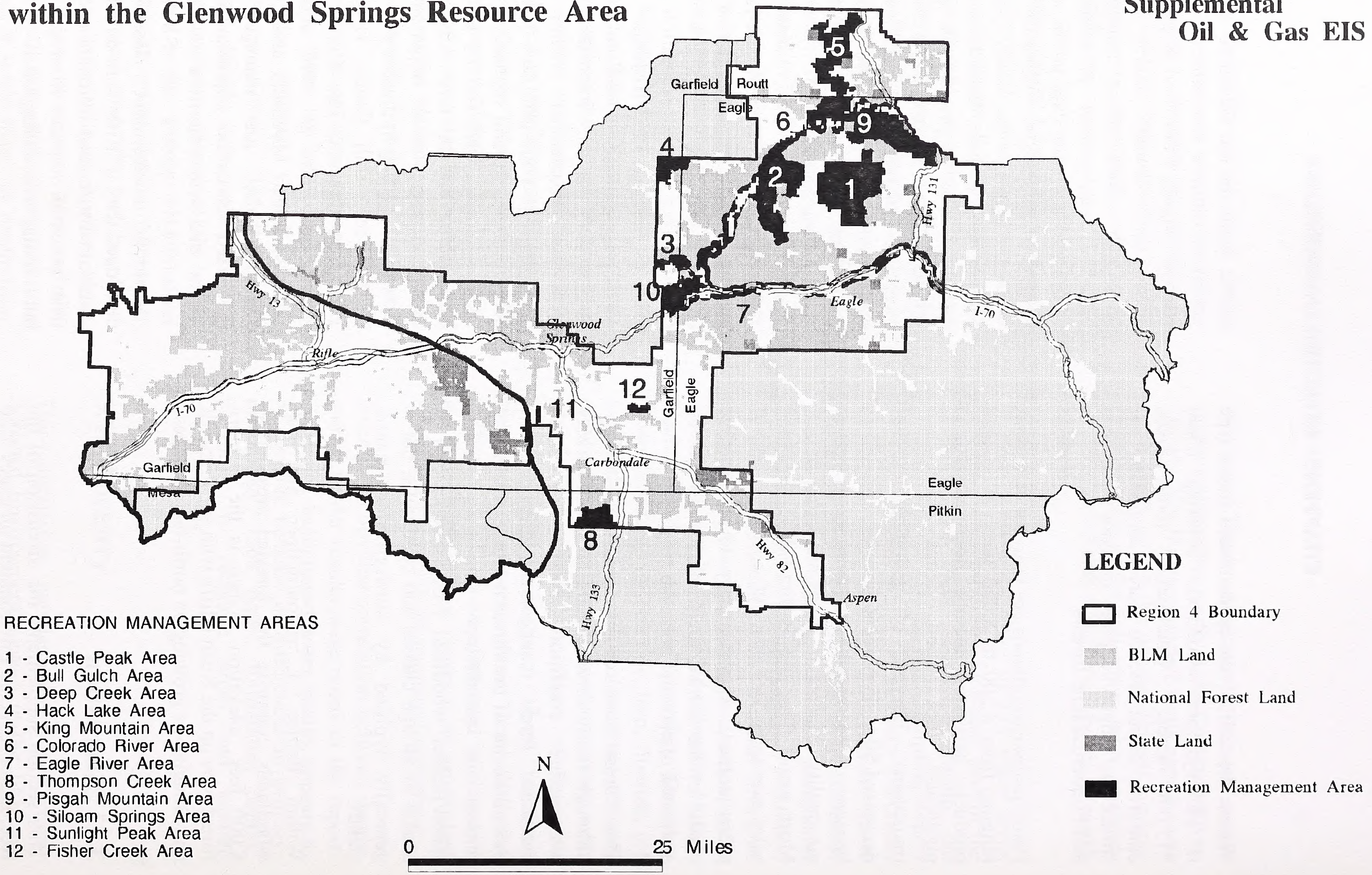
Public lands in the Resource Area provide a variety of outdoor recreational opportunities in settings ranging from rural to primitive. Some public lands contain unique or outstanding recreation values which require special or intensive management to protect recreation values and accommodate public use, and were designated as Special Recreation Management Areas (SRMAs) in the RMP. Management of SRMAs may include restrictions on recreation and other uses to protect the quality of the setting or the visitor's experience. General recreation management classes were also designated for all public lands according to the Recreation Opportunity Spectrum (ROS) classification system.

There are several SRMAs in the Resource Area, but none are found in Region 4. The Upper Colorado and Eagle Rivers are managed to provide river related recreation opportunities such as floating and fishing. These river corridors are mainly in rural-natural settings and the scenery is an important part of the recreational experience. Other SRMAs are managed to provide primitive to semi-primitive non-motorized upland recreation opportunities, such as hunting, back country camping, hiking, backpacking and so forth. A predominantly natural character is an important part of the recreational setting in these areas, which include Deep Creek, Bull Gulch, Hack Lake, and Thompson Creek. The Castle Peak Travel Managemetn Plan in 1997 added two new SRMAs: Bocco Mountain and Gypsum Hills. These SRMAs are managed to provide motorized recreation opportunities in roaded-natural and semi-primitive motorized settings. Table 3.11-1 shows the SRMAs and the recreation management classification. A developed City of Rifle park on patented land is underlain by federal minerals and is protected from potential impacts from gas development, but it is also outside Region 4.

Map 3.11-1

Recreation Management Areas within the Glenwood Springs Resource Area

Glenwood Springs
Resource Area
Supplemental
Oil & Gas EIS



In Region 4, public lands mainly provide opportunities for dispersed recreation in rural to semi-primitive motorized settings. Predominant activities include big game and small game hunting, undeveloped camping, OHV riding and sightseeing by driving on back country dirt roads. Public land river access sites on the Colorado River are very limited. There are a few relatively small areas of public land containing semi-primitive non-motorized qualities, but they are not presently managed for those values. These areas exist mainly due to the lack of vehicle access, either because they lack roads or lack legal public access on existing roads.

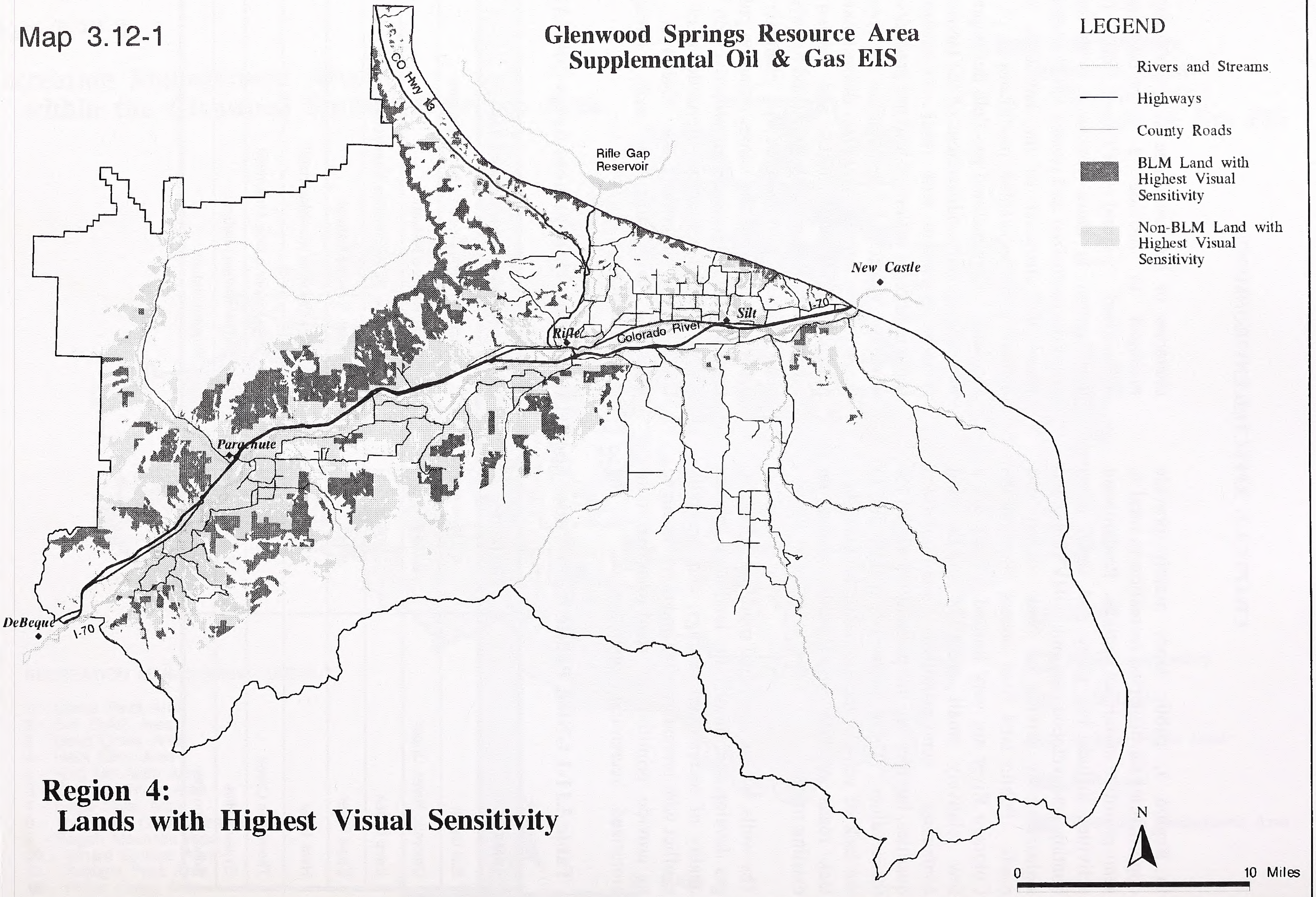
The wells, access roads and pipelines related to gas development modify the landscape and the quality of recreational settings, and generally conflict with recreation sites and areas managed to provide primitive or semi-primitive non-motorized recreation opportunities. The character of the landscape in these areas is managed to provide a predominantly unmodified natural setting. Gas field development is more consistent with semi-primitive motorized and roaded natural settings where the character of the landscape may include some substantial modifications of the landscape. Concentrated gas field development with widespread modifications of the landscape is more consistent with rural and urbanized settings where a variety of land use practices are obvious. Table 3.11-2 summarizes the acreage by recreation management class designation for public lands in the GSRA and Region 4. Inventory classifications are included for private lands in Region 4 because the character of private lands affects the values found on public land, but BLM management objectives do not apply on private property. Appendix H of the Draft SEIS describes the objectives for managing the setting in each recreation management class.

Table 3.11-1 GSRA Public Land Under Special Recreation Management Areas (SRMAs)

SRMA	Size (Acres)	Recreation Management Class
Bull Gulch	9,839	Primitive, Semi-Primitive Non-Motorized
Colorado River, Upper	21,618	Rural, Roaded Natural
Deep Creek	2,406	Primitive, Semi-Primitive Non-Motorized
Eagle River	8,415	Rural, Roaded Natural
Hack Lake	3,336	Semi-Primitive Non-Motorized
Thompson Creek	4,270	Semi-Primitive Non-Motorized
Gypsum Hills	16,930	Semi-Primitive Motirzed
Bocco Mountain	1,396	Roaded Natural

Map 3.12-1

Glenwood Springs Resource Area Supplemental Oil & Gas EIS



Region 4: Lands with Highest Visual Sensitivity

Table 3.11-2 GSRA Recreation Management Classes

Recreation Management Class	Resource Area BLM Total (Acres)	Region 4 BLM (Acres)	Region 4 NOSR Production Area (Acres)	Region 4 Split Estate (Acres)	Region 4 Private (Acres)
Primitive	597	0	0	0	0
Semi-Primitive Non-Motorized	37,180	837	0	1,487	1,533
Fall Only, Semi-primitive Non-Motorized	3,848	0	0	0	0
Semi-Primitive Motorized	250,314	47,356	0	15,174	54,023
Roaded Natural	236,425	82,840	11,407	22,471	159,835
Rural	29,214	7,792	183	1,865	35,167
Urban	424	2	0	0	4,475

3.12 Visual Resources

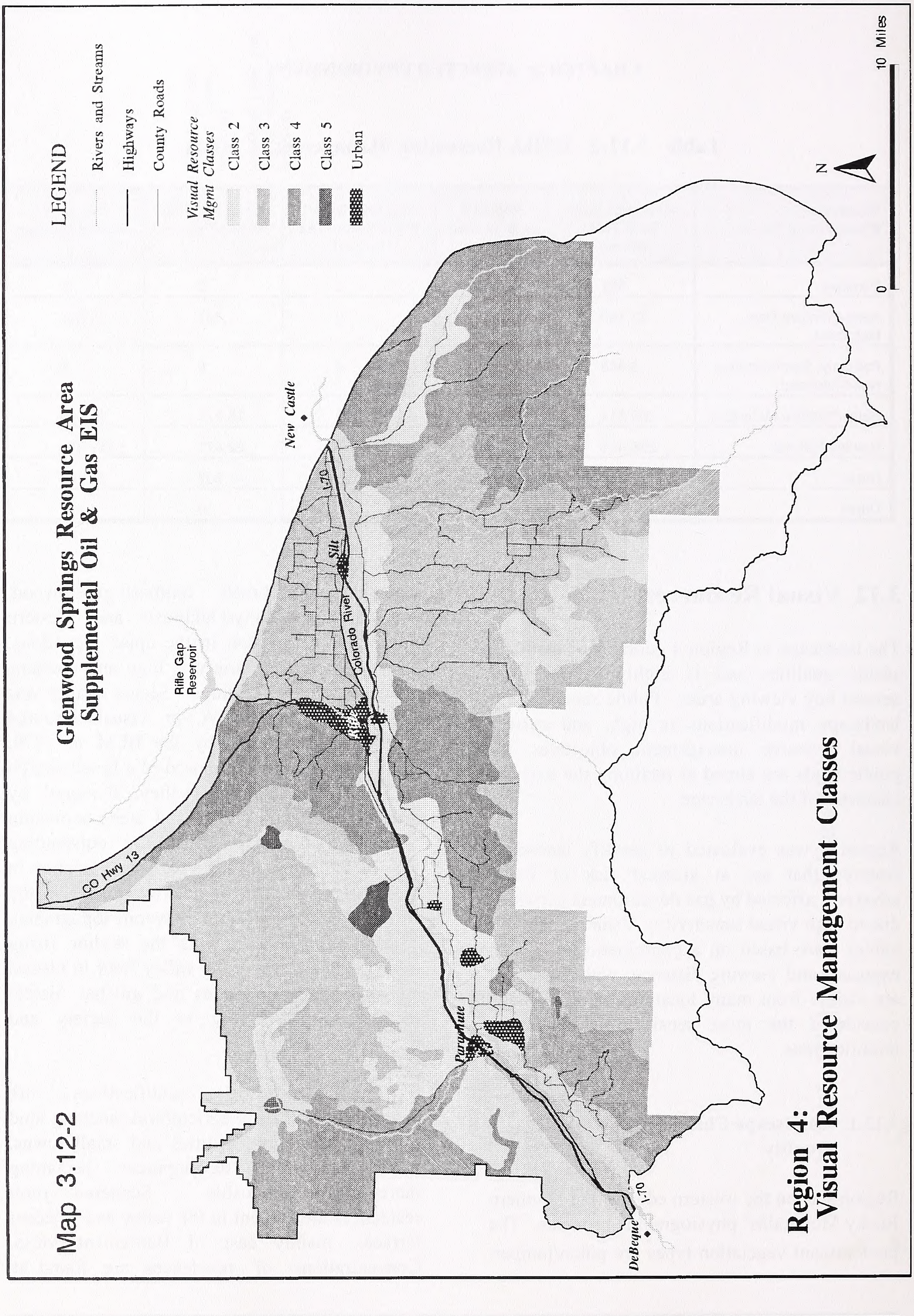
The landscape in Region 4 contains outstanding scenic qualities and is highly visible from several key viewing areas. Public sensitivity to landscape modifications is high, and current visual resource management objectives for public lands are aimed at retaining the existing character of the landscape.

Region 4 was evaluated to identify landscape features that are at greatest risk of being adversely affected by gas development activities due to high visual sensitivity. Visual sensitivity values were based on a combination of visual exposure and viewing distance, with areas that are visible from many locations at close range considered the most sensitive to landscape modifications.

3.12.1. Landscape Character and Scenic Quality

Region 4 is on the western edge of the Southern Rocky Mountains' physiographic province. The predominant vegetation types are piñon/juniper, woodland, Sagebrush, Saltbush-greasewood, Mountain Mahogany-Oakbrush, and Western Spruce-Fir with aspen in the upper elevations. Overall landscape variety is high and contains many outstanding features. Scenic quality was rated Class B and A in visual resource inventories conducted by the BLM in 1979. Region 4 is mainly composed of a broad stretch of the Colorado River valley, bordered by mesas, terraces, foothills and steep mountain slopes. The Roan Cliffs are outstanding landforms which provide a dramatic backdrop in the scenery of much of the river valley in the western part of Region 4. Overall topographic relief is considerable, with the skyline rising over 4,000 feet above the valley floor in places. Numerous side drainages and gulches dissect the landforms, adding to the variety and topographic texture.

Existing landscape modifications are characteristic of rural agricultural-ranching land uses, transportation, utilities and small towns, with gas field development becoming increasingly noticeable. Scattered rural residences are evident in the valley and adjacent terraces, mainly east of Battlement Mesa. Concentrations of residences are found at



Map 3.12-2

Region 4:
Visual Resource Management Classes

Glenwood Springs Resource Area
Supplemental Oil & Gas EIS

Battlement Mesa, Holms Mesa, Taugenbaugh Mesa, Silt Mesa, and in and around the towns of Rifle, Parachute, Silt and New Castle. Irrigated hayfields, orchards and dry-land pastures are found throughout the valley and mesas. Gas development modifications are most evident along Interstate 70 between Parachute and Rifle, particularly in Sharrard Park, Webster Mesa, and along Parachute Creek where many well pads, tank batteries, compressor stations and related pipelines and roads are located. Gas development is becoming noticeable on the slopes in the Porcupine Creek basin, where new wells are being developed.

3.12.2 Key Viewing Areas and Viewsheds

The viewing areas are Battlement Mesa, Highway 13, Holms Mesa, Interstate 70, Parachute Creek Road, and the Town of Rifle. The landscape seen from these viewing areas is affected by existing gas development and includes areas that are most likely to be affected by future development. Interstate 70 and Highway 13 are important because Region 4 is a significant part of the scenery along these routes, with their high viewing volume. The other viewing areas are important because they are populated areas; residents experience the scenery of Region 4 daily.

Viewsheds were delineated for the key viewing areas with an automated program using a 30 meter cell digital elevation model to show the lands that are seen from each viewing area and indicate the relative exposure of landscape features, with visibility limited by topographic screening. Because of the open character of the landscape, many views range from the immediate foreground to over fifteen miles, depending on the location. A complete set of individual viewshed maps is on file in the GSRA office.

As shown in Table 3.12-1 below, public lands are an important part of the field of view in all of the viewsheds, but private lands make up the majority of the visible landscape.

Table 3.12-1 Landscape Visibility and Ownership, Region 4 *(in acres)*

VIEWSHED	Total	BLM	BLM/ NOSR	NOSR/ PROD	PRIVATE	FOREST	STATE	SPLIT ESTATE
Battlement Mesa	30,141	7,022	520	4,013	16,955	610	0	1,021
Highway 13	123,231	30,466	7,459	1,014	50,440	18,891	2,010	12,951
Holms Mesa	45,682	8,571	2,164	7,689	23,374	1,781	0	2,103
I-70	185,384	42,232	7,279	8,595	90,944	21,664	1,647	13,023
Parachute Creek	47,637	10,084	218	1,822	29,518	2,815	0	3,180
Rifle	68,551	18,847	3,830	1,345	29,871	7,641	682	6,335

3.12.2. Visual Exposure and Sensitivity

Visual exposure and viewing distance were evaluated to determine visual sensitivity. Landscape features that are visible from many locations in a given viewing area are considered more important than those that are seen from only a few places. Visual exposure is mainly influenced by the character of the terrain, with some features highly exposed to viewing because of elevated location, orientation or lack of screening; others are largely hidden from view. Landscape modifications in these highly exposed areas would be prominent and noticeable from many places. Visual exposure maps with classifications ranging from 'seldom-seen' to 'very high' for each viewshed are on file.

As viewing distance increases, landscape features become smaller, lose resolution and become part of the broader scenery. Greater visual sensitivity is given to areas that are viewed at close range where details of landform and vegetation features can be easily discerned and the visual contrast of modifications can be readily noticed by the casual observer. The foreground distance zone, extending up to three miles from the observer, is of greatest importance and careful attention to visual contrasts of management activities is needed to avoid visual impacts that attract attention. The middle ground from three to five miles is of lesser importance in most instances, but large scale and linear projects can have noticeable visual impacts which could attract attention and detract from natural landscape qualities. The background zone beyond five miles is of relatively little importance in visual resource management, except in extreme cases where major landscape modifications are involved, such as in large scale, extensive earthwork or vegetation treatment that may affect a noticeable portion of the field of vision.

Landscape modifications related to gas development can be noticeable and attract attention in the foreground and middle ground distance zones because of the relatively large scale of surface disturbance required for well pads, access roads and pipelines. Distance zones were delineated for each key viewing area, and a composite of the foreground zone is shown in maps on file.

Visual sensitivity was determined for each viewshed using the visual exposure and viewing distance criteria indicated in Table 3.12-2 below. Visual sensitivity values provide a measure of concern for maintaining visual qualities. Map 3.12-1 is a composite map of areas with the highest visual sensitivity from all viewing areas. Visual sensitivity maps for each key viewing area are on file.

Table 3.12-2 Landscape Sensitivity, Region 4
Visual exposure and viewing distance criteria used to determine visual sensitivity.

VISUAL EXPOSURE	VIEWING DISTANCE			
	NEAR FOREGROUND	FOREGROUND	MIDDLE GROUND	BACKGROUND
VERY HIGH	Very High	Very High	High	Moderate
HIGH	Very High	Very High	High	Moderate
MODERATE	High	High	Moderate	Low
LOW	Moderate	Moderate	Moderate	Low
SELDOM SEEN	Moderate	Moderate	Low	Low
NOT SEEN	Low	Low	Low	Low

3.12.4 Current Visual Resource Management

Current Visual Resource Management (VRM) objectives were established in the 1984 Resource Management Plan and are generally aimed at protecting the most scenic public lands, especially those lands that receive the greatest amount of public viewing. Current VRM Classes place less emphasis on areas of relatively common scenery that are seldom seen by the public or are visible in the background. With a couple of exceptions, current VRM Classes are mainly aimed at protecting visual resources on public lands seen from I-70.

Map 3.12-2 shows the current VRM classes for Region 4. Table 3.12-3 shows the acreage under each Class by land status. Visual resource management objectives do not apply to non-BLM lands, but visual concerns may be addressed on split estate where federal minerals occur. VRM classes shown for non-public lands are an indication of the visual values for those lands, and those values are only protected by landowner discretion. The classes range from Class I (highest) to Class V. The management objectives for the various VRM classes are described Appendix H.

Table 3.12-3 Current VRM Classes, Region 4 *(in acres)*

OWNERSHIP	CLASS II	CLASS III	CLASS IV	CLASS V
BLM	24,928	29,511	45,846	234
BLM NOSR	4,248	32,884	827	340
NOSR-Prod	9,645	587	12	1,345
Forest	65,834	5	1	0
Private	65,834	101,899	81,232	774
State	2,828	1	9,814	0
Split Estate	696	44	8427	0

3.13 Cultural Resources

This section supplements the discussion of cultural values in the FEIS, 3-23 and 3-24.

Cultural resources include prehistoric and historic archaeological and architectural resources and traditional cultural and religious properties. In the GSRA, cultural resources, both known and unidentified, include lithic scatters, quarries, temporary camps, extended camps, villages, rockshelters, wickiups, hunting sites, kill/butchering sites, processing areas, tree scaffolds, eagle traps, vision quest sites, caves, petroglyph/pictograph panels, trails, toll roads, wagon roads, water ditches, reservoirs, bridges, homesteads, ranches, cabins, mills, railroads, transmission lines, mines, trash dumps, aspen art, race tracks, vapor caves, isolated artifacts, traditional cultural properties, sacred/religious places, and graves. These resources span approximately 12,000 years and represent use in the area by Paleo-Indian, Archaic, Ute, Comanche, and Euroamerican cultures.

Several important cultural resources are located in the GSRA. The archaeological ACEC, covering 4,178 acres outside of Region 4, contains a high density of significant cultural resources, especially from the early Archaic period. Another area also outside Region 4, includes a variety of sacred sites and traditional cultural properties that have religious value for the Ute people and are also archaeologically important. A wickiup village within Region 4 once had over 30 standing conical wooden houses, probably built in the early 1800s. Wickiup villages of this size are rare and wickiup sites, or even Ute sites, with historic artifacts are very rare. Native American sites with historic artifacts are important for providing baseline information from which archaeologists can trace back known cultures and compare prehistoric sites in order to examine cultural changes.

3.14 Paleontological Resources

This section replaces the discussion of paleontological resource in the FEIS on pages 3-24 and 3-25.

Paleontological resources include vertebrate, invertebrate, and plant fossils found in formations throughout the GSRA. The geology of the GSRA spans roughly 1.8 billion years. The geologic formations have been classified to indicate the potential for scientifically important fossils. Classification of formations or members of formations may change as data becomes available.

- Class I - Areas known or likely to produce abundant scientifically important fossils vulnerable to surface-disturbing activities.
- Class II - Areas showing evidence of fossils but unlikely to produce abundant scientifically important fossils.
- Class III - Areas that are unlikely to produce fossils.

The Class I formations in the GSRA where scientifically important vertebrate fossils are known to occur are, from the youngest to the oldest: the Wasatch, Morrison, Chinle, and State Bridge Formations. Scientifically important invertebrate fossils are known from the even younger Parachute Creek member of the Green River Formation at a stratigraphic location between the R-6 Oil Shale Zone and the Mahogany Zone between Rifle and DeBeque and the southern rim of the Piceance Creek Basin. It is easily recognized as the steep whitish cliffs near the crest of the Roan Plateau.

The Eocene Green River Formation, particularly the Parachute Creek member, includes fossil insects (over 100 species), plants, gar and other fish, turtles, and crocodilians (with gastroliths - stomach stones). An invertebrate collection from this formation in the GSRA is curated at the Smithsonian Institution and studied by scientists from around the world since it represents about 90 percent of all known Cenozoic insect orders and exhibits great bio-diversity. The collection is also important for investigations of interactions between plants and insects. The formation is in the NOSR Production Area of Region 4.

The Paleocene Wasatch Formation includes early horses, rare primates, rhinoceroses, birds, crocodiles, rodents, fish, turtles, fresh water clams, snails, and plants. The Jurassic Morrison and Triassic Chinle Formations include dinosaurs. The Paleozoic State Bridge Formation has vertebrates and invertebrates. There are no paleontological ACECs in the GSRA; however, Sharrard Park contains a high density of scientifically important paleontological resources.

3.15 Wilderness

This section replaces the section on wilderness in the FEIS on page 3-25.

Wilderness inventories completed in 1980 identified four Wilderness Study Areas (WSAs) in the GSRA, none of which are located in Region 4. Wilderness recommendations for the WSAs were made through the RMP completed in 1984, and were submitted to Congress in 1991, but no designations have been enacted. Pending wilderness legislation, WSAs are under interim management to protect wilderness values. Table 3.15-1 shows the WSAs, size and wilderness recommendations.

Table 3.15-1 GSRA Wilderness Study Areas

WSA Name	Size (Acres)	Recommended for Wilderness	Not Recommended for Wilderness
Bull Gulch (CO-070-430)	15,201	10,414	4,787
Castle Peak (CO-070-433)	12,237	0	12,237
Eagle Mountain (CO-070-392)	312	312	0
Hack Lake (CO-070-425)	10	10	0
Total	27,760	10,736	17,024

The size of some of the WSAs shown in the table differs slightly from that shown for the same areas in previous planning documents due to more accurate area calculations recently completed.

Under current management, public lands in the WSA's are not available for leasing, and they contain no current leases. Lands released by Congress for uses other than wilderness would become available for leasing subject to stipulations in effect at the time of leasing.

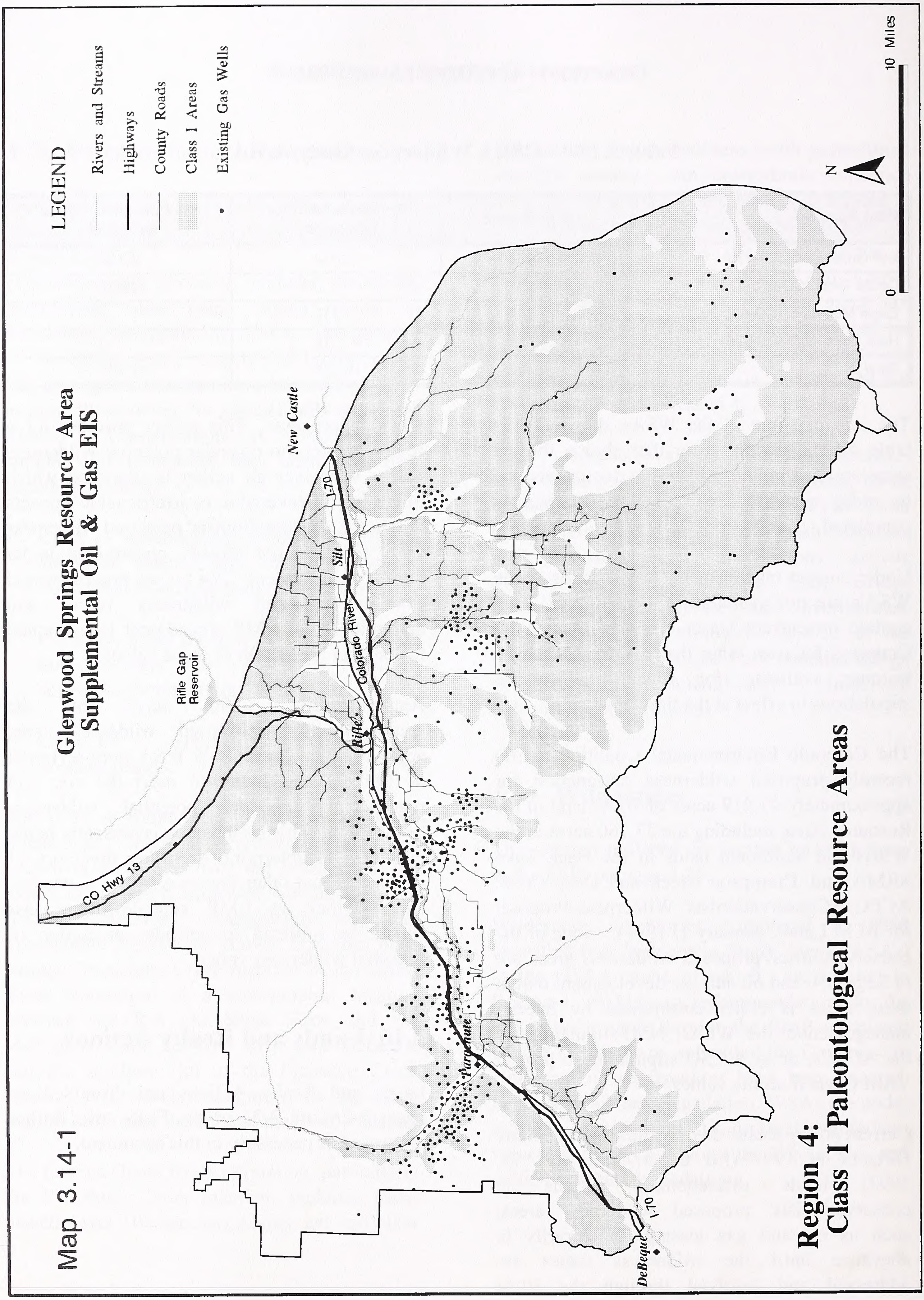
The Colorado Environmental Coalition (CEC) recently proposed wilderness designation for approximately 43,919 acres of BLM land in the Resource Area, including the 27,760 acres in the WSAs and additional lands in the Hack Lake SRMA and Thompson Creek and Deep Creek ACECs (Conservationists' Wilderness Proposal for BLM Lands, January 1, 1994). None of the conservationists' proposed wilderness areas are in Region 4, and oil and gas development within these areas is either constrained by interim management of the WSAs, NSO stipulations in the ACECs, or by a CSU stipulation to protect VRM Class II scenic values.

Current policy established by the Colorado State Director in 1997 (IM CO-97-044, May 19, 1997) holds discretionary actions in conservationists' proposed wilderness areas, such as oil and gas leasing, temporarily in abeyance until the wilderness issues are addressed and resolved through the BLM planning process. This policy provides for a review process to consider potential wilderness values whenever an action is proposed which might have irreversible or irretrievable impacts within the conservationists' proposed wilderness areas that are not already constrained under current management. The review process would evaluate potential wilderness values and determine if an RMP amendment is warranted to consider protection of those values.

Approximately 3,690 acres of the conservationists' proposed wilderness area adjacent to the Castle Peak WSA were reviewed in 1997-98 and found to meet the size and roadless criteria for potential wilderness designation. This review area is presently being evaluated to determine if further inventory of wilderness and other resource values is needed, and whether an RMP amendment process should be initiated to consider protection of potential wilderness values.

3.16 Lands and Realty Actions

Lands and Realty Actions are discussed on pages 3-26 and 3-27 of the FEIS. No further discussion is necessary in this document.



Map 3.14-1

Glenwood Springs Resource Area
Supplemental Oil & Gas EIS

Region 4:
Class I Paleontological Resource Areas

3.17 Transportation

This discussion replaces the Transportation discussion in the FEIS on page 3-27.

Travel within the GSRA and Region 4 is provided by Federal and State highways, County roads, public roads, National Forest roads and BLM-administered roads. Many of the public lands administered by the BLM are accessible to the public by one or more of these kinds of roads.

Map 3.17-1 shows the existing transportation system featuring roads within Region 4. The current road inventory indicates about 83 miles of Interstate highway, 38 miles of State highway, 303 miles of County roads including about 289 miles within Garfield County, 178 miles of National Forest system roads, and 423 miles of roads administered by BLM. There are also about 34 miles of BLM non-motorized trails within Region 4.

BLM annually maintains an average of 75 miles of roads accessible to the public within the GSRA with an increase of 25-50 miles expected for roads within the recently acquired Naval Oil Shale Reserves. Of the 75 mile total for the resource area, about 25 miles are maintained within Region 4. Oil and gas operators are responsible for periodic maintenance of BLM roads used for their operations.

An assessment was conducted and found that 57 miles of roads have been specifically constructed for oil and gas development on public lands. About 60 percent of the 57 miles were built on public lands and the remaining 23 miles were constructed on private lands, including split estate holdings.

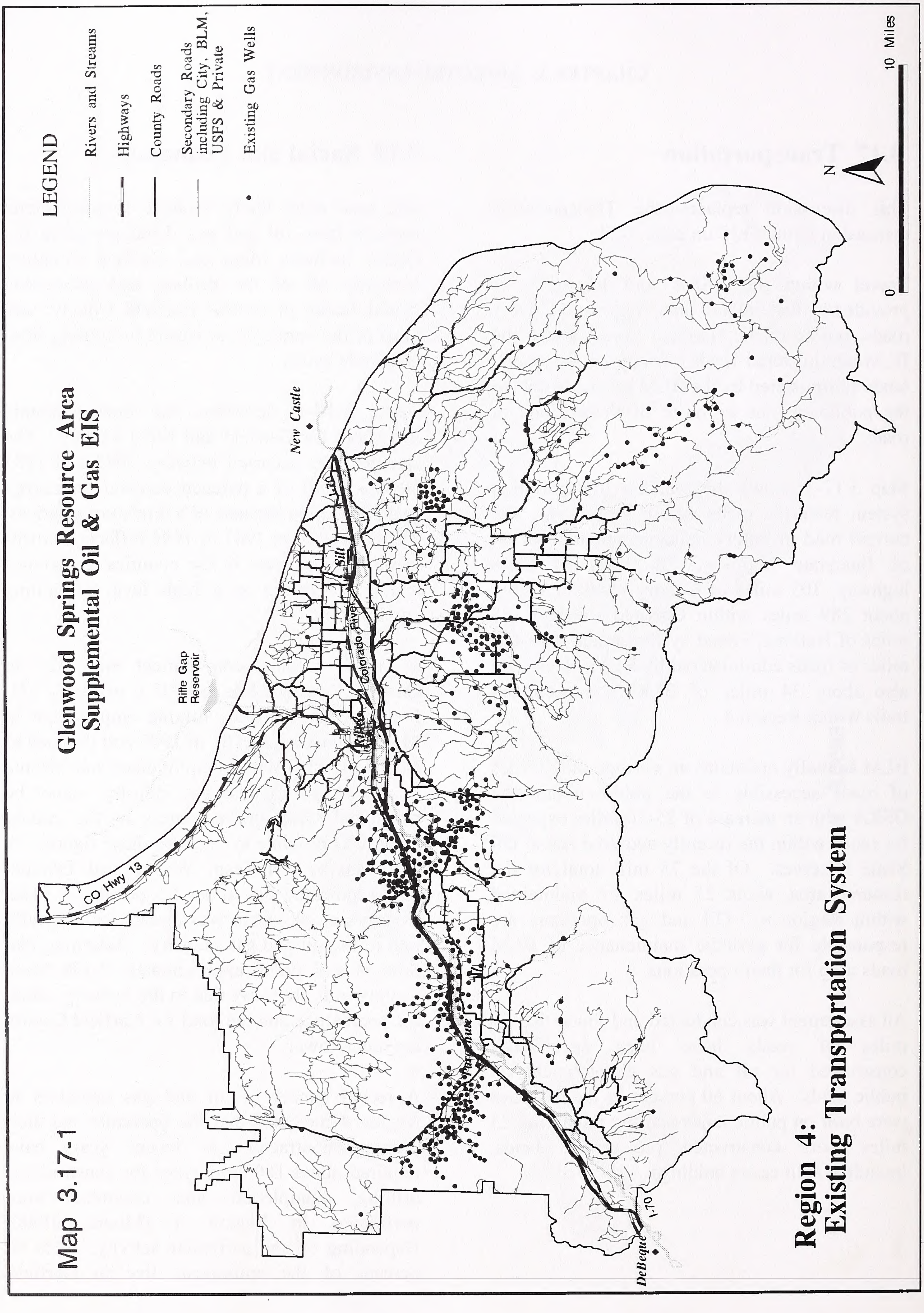
3.18 Social and Economic

The area most likely to have socioeconomic impacts from oil and gas development in the GSRA includes Mesa and Garfield Counties. Virtually all of the drilling and production would occur in central Garfield County, and most of the employment would be coming from Garfield County.

Table 3.18-1 describes the socioeconomic indicators for Garfield and Mesa County. The changes that occurred between 1982 and 1987 are the result of a reduced demand for energy fuel production because of a downturn in prices. The change from 1987 to 1995 reflects a broad-based improvement in the counties' economies and not a return to a high level of mining employment.

In 1985, mining employment was 725 in Garfield County while in 1995 it was only 171. For the same period, mining employment in Mesa County was 1,183 in 1985 and dropped to 608 by 1995. While employment and income related to the oil and gas industry cannot be calculated with any exactness at the county level, it is possible to estimate those figures. A 1981 survey (McKean, Weber, and Ericson, 1981) indicated that about 5.5 percent of Mesa County's employment was directly or indirectly tied to the oil and gas industry. Assuming that ratio is still good, approximately 3,199 Mesa County jobs are today tied to the industry. Both the percentage and the total for Garfield County are much lower.

A recent survey of oil and gas operators in Region 4 indicated that the operators and their primary contractors in recent years have required about 160 employees for construction, drilling, completion and overhead work performed in Region 4 (Moore, 1998). Depending on the particular activity, 30 to 90 percent of the employees live in Garfield



Map 3.17-1

Glenwood Springs Resource Area Supplemental Oil & Gas EIS

Region 4: Existing Transportation System

County; the rest live primarily in Mesa County. Assuming an annual average salary of $40,000, this level of employment would represent an annual payroll of about $6.5 million.

Table 3.18-1 GSRA Socioeconomic Indicators

Indicator	1982	1987	1995	% Change	
				1982-87	1987-95
Garfield County					
Population	28,751	25,655	29,974	-10.8%	16.8%
Employment	17,031	14,893	19,559	-12.6%	31.3%
County Revenue *	13.4	11.9	15.4	-11.2%	29.4%
Personal Income*	376.0	365.4	468.4	-2.8%	28.2%
Mesa County					
Population	94,075	86,498	93,145	-8.1%	7.7%
Employment	49,186	43,515	58,166	-11.5%	33.7%
County Revenue*	N/A	N/A	60.7		
Personal Income	1,063.2	1,126.3	1,234.3	5.9%	9.6%

**Millions of dollars*

Gas production in Region 4 in 1996 was 36,254,760 mcf from an estimated 545 producing wells. Oil and gas sales volume from federal wells in Fiscal Year 1997 in Garfield County was $7,860,998. This yielded a royalty value of $3,408,991 to the federal Government, based on a royalty payment of 12.5 percent of the value of production. Of the total federal royalty, 50 percent, $1,704,503, was disbursed to the State of Colorado.

Appendix F, Government Revenues, includes a flow chart that describes the way in which the State of Colorado distributes its 50 percent share of the royalty revenues returned by the federal government. In the most general terms, the county of origin for the federal royalties can receive up to 50 percent of the state's share. However, the distribution is quite complicated and the county's share of the distribution is *capped* at several points. Excess funds are then re-routed until yet other thresholds are reached. Moreover, the county's Payments in Lieu of Taxes (PILT) from the federal government are reduced by the amount of the royalty distribution so that the county government itself may not benefit greatly although other jurisdictions within the state and the county benefit greatly.

In 1997, Garfield County received $319,000 of the federal revenues returned to the state. The school district received $100,000 and the cities and towns in Garfield County received $131,000. Oil and gas sales volume for Fiscal Year 1997 in Mesa County was $2,336,783 which yielded a royalty value of $1,011,983, of which half ($505,996) was disbursed to the State of Colorado. Of the money disbursed, Mesa County received $215,000 with the School District receiving $81,000 and the cities and towns receiving $28,000.

The 1997 severance tax direct distribution is based on distributing fifteen percent of the revenues in the local government Severance Tax Fund to counties or municipalities on the basis of residence of severance taxpayer employees as reported to the Department of Revenue by severance taxpayers. Jurisdictions in Garfield County had 21 oil and gas employees and received $29,405.

Since 1994, jurisdictions within Garfield County have also received about $2.7 million in three separate grants from the Local Government Mineral Impact Fund. This fund is made up of portions of Colorado's federal mineral receipts and state severance tax collections (Colby, 1998).

Hunting and Fishing Revenues. Hunting and fishing activities are important contributors to the economy of Colorado. For example, according to one model, hunting and fishing activities generate over 30 million dollars annually in Garfield County alone. (Browne, Bortz, and Coddington, Inc, 1998)

Quality of Life. Public lands within the GSRA also provide a variety of benefits to adjacent landowners and communities that are much more difficult to quantify than the socioeconomic indicators provided here. These benefits include contributions to a person's quality of life, like scenic views, open space, opportunities for recreation, habitat for wildlife, clean air and water. While oil and gas development certainly provides some economic opportunities for residents and communities, such as employment and tax revenues, such development is perceived by some as detracting from their quality of life. In most cases, this perception is shared by those not directly benefitting from the industries activities. For example, complaints about noise, dust, traffic, safety and visual impacts are common. Most of these concerns are related to oil and gas activities on private lands. However, in some cases, oil and gas development on BLM lands adjacent to or in view of residential areas, or in cases of split estate or intermingled ownership, these quality of life issues can be associated with management of federal oil and gas leases.

Based on the comments received during public review of the Draft SEIS, it is apparent that opinions regarding the impact of oil and gas development on quality of life are very much dependent on the perspective of the reviewer. Some see oil and gas development as an economic opportunity, an important and legitimate use of natural resources, that offers a secure lifestyle and contributes to the nation's demand for fuel. Others view the same development as a negative impact on their property values, an over-emphasized use of public lands, that detracts from their lifestyle choices while benefitting only those associated directly with the industry.

As described throughout the SEIS, oil and gas development is only one of several factors contributing to the modification of the landscape throughout the GSRA. Other major factors include rapid population growth and residential developments, Interstate 70, increasing recreational use of public lands and the expansive federal, state and county road systems. All these factors, and others, influence the quality of the natural and economic environment, which in turn affects the quality of life of the area's residents. However, depending on the perspective of the resident, these factors contribute to their quality of life in different ways and to different degrees.

Since quality of life is more a matter of personal perspective than a definitive outcome which BLM can directly affect, BLM will not attempt to quantify quality of life issues nor prescribe a desired outcome. Rather, BLM will focus the SEIS more on the specific factors which might affect quality of life, like wildlife, recreation, air and water quality and scenic viewsheds.

3.19 Areas of Critical Environmental Concern

Areas of Critical Environmental Concern (ACEC) are discussed in the FEIS on page 3-32. Any additional information on such areas in the GSRA is included in Sections 3.11, Recreation and 3.12, Visual Resources.

3.20 Minerals

This section supplements the discussion of Mineral Resources in the FEIS on pages 3-32 through 3-36.

3.20.1 Oil and Gas

Geology. Region 4 lies within the Piceance Basin. The Piceance Basin is bounded on the north by the Axial Basin Uplift, on the east by the White River Uplift, and on the south by the San Juan volcanics and Uncompahgre Uplift. It is separated from the Uinta Basin to the west by the Douglas Creek Arch. The Piceance Basin is highly asymmetrical with a gently dipping western flank and a steeply dipping eastern flank, known as the Grand Hogback Monocline.

Within Region 4, natural gas has been developed from two formations; the Wasatch and the Mesaverde Group. The Wasatch Formation is a thick sequence of variegated shales and fluvial sandstones that represents a mixture of fluvial, alluvial and piedmont deposits. Wasatch well depths vary from 1,500 feet to 3,000 feet. Very little Wasatch development has occurred in recent years.

The Mesaverde Group is divided into the deposits of the Iles Formation (includes Rollins, Corcoran, and Cozzette sandstone members) and the overlying massively stacked, lenticular nonmarine Williams Fork Formation (including the Cameo Coals). Early Mesaverde development within Region 4 was primarily in the Cozzette and Corcoran sandstones. The primary development over the past several years has been from the Williams Fork Formation. The Williams Fork Formation is a 1500 to 4000 foot thick package of tight sands, shales and coals. The sands are point bar deposits stacked into a composite of meander-belt reservoirs each 20 to 60 feet thick and about 1500 feet wide, with considerable internal discontinuity and compartmentalization. Williams Fork wells vary in depth from around 5,000 feet to 10,000 feet with the shallower wells being in the Hunter Mesa area and the deeper wells being in the Flatiron Mesa area. The increase in Williams Fork development in recent years, has been a result of agressive development of the total stack of lenticular sands intersected by a wellbore. This approach included completing the well in multiple zones, increasing the size of the proppant load used in hydraulic fracturing, and using sophisticated fracturing fluids and procedures.

Leasing. In accordance with the 1920 Mineral Leasing Act, and subsequent amendments, BLM holds quarterly lease sales of the oil and gas mineral estate. These quarterly lease sales are for all BLM resource areas within Colorado. Since 1992, new leases offered in the GSRA have been limited, about one a year, because most of the prospectively promising oil and gas area, referred to in this document as Region 4, is already leased. Prior to the acquisition of the NOSR, BLM managed 151,045 acres of BLM surface and mineral estate in Region 4. Almost 95 percent, 143,068 acres, is held in 379 oil and gas leases, the majority issued prior to 1991.

Although the primary term of a lease expires after a ten year period, leases are extended indefinitely, as long as they remain capable of producing oil or gas in paying quantities. These leases are considered to be held by production. Most of the leases in Region 4 are held by production and can be expected to continue to be held into the future. Unleased parcels, or parcels occasionally terminating from an undeveloped lease within Region 4, are generally requested by industry for new lease issuance.

The transfer of the NOSR from DOE to BLM increased the mineral estate managed by the GSRA by 49,892 acres. None of this land has ever been leased; during the fall of 1998, portions of the 11,590 acre NOSR Production Area will be offered for lease on terms developed in this plan amendment process. The remaining 38,302 acres will be offered for lease in the future, after an additional planning process.

Leases are issued with the right to fully explore and develop the mineral resource, with all the attendant surface disturbance and resource impacts, consistent with the terms and conditions of the lease, laws and regulations. Leases issued up to 1976 had few conditions for environmental protection. Those issued after 1976 contained what are referred to as the Standard Terms and Conditions. The most frequently cited term is *Section 6, Conduct of Operations*, which requires that operations be conducted so as to minimize "adverse impacts to the land, air, and water, to cultural, biological, visual, and other resources, and to other land uses or users." Leases issued after the completion of the GSRA Resource Management Plan (RMP) in 1984 were issued with Standard Terms and Conditions and with additional environmental stipulations developed as part of the RMP. Leases issued after the FEIS in 1991 held the Standard Terms and Conditions and the new stipulations developed in the FEIS. Appendix B contains a more extensive description of the leasing process and lease rights and Appendix D contains the Standard Terms and Conditions.

Drilling Activity. Refer to Section 4.20.1, Minerals, Impacts to Date, for a discussion of drilling activity on public mineral estate in region 4.

For all of the 117 producing gas wells, 48 (41 percent) are on private surface with federal minerals.

Chapter Four

ENVIRONMENTAL CONSEQUENCES

4.1 Introduction

Chapter 4 of the FEIS described the Environmental Consequences of the alternatives considered in that document. Those portions of that original evaluation that remain accurate and sufficient are not repeated here. Those portions that require replacement, modification or more extensive information are included in this chapter. Each section of this chapter references its counterpart in the original document and notes whether it replaces, modifies or supplements the description in the original FEIS.

As discussed in Chapter 1, the focus of this SEIS is on Region 4 of the GSRA, the area of highest potential for oil and gas development. Within Region 4, the Production Area of the recently acquired NOSR receives additional attention, as it was not included in the original EIS. That part of the NOSR north of the Production Area is not formally included in the analysis, but may be mentioned. The remainder of the GSRA will be referenced occasionally as needed.

This analysis of environmental impacts differs from those found in other EISs in that it includes an evaluation of impacts that have occurred as a result of oil and gas development to date. Ordinarily, impacts that have already occurred would have become part of the affected environment and would have been considered in that portion of the document. However, in this case, it was determined that the reviewer would be better served by including the evaluation of impacts that have already occurred with the evaluation of those that may occur in the future under each alternative. In this way, impacts to date can be described under the same conditions and impactors as future impacts would be described. In addition, the analysis of past impacts determines to a great extent how future impacts are evaluated. For example, the average per well surface disturbance to date is the best guide to disturbance that wells in the same area would generate in the future.

Four alternative courses of management action are analyzed here: the original three from the Draft SEIS (the Continuation of Current Management Alternative, the Maximum Protection Alternative, and the Proposed Action) and the Preferred Alternative. The alternatives are described more fully in Chapter 2, the Preferred Alternative, and in Appendices A through C. The difference between each of the alternatives is the combination of mitigation measures that BLM would apply to oil and gas leasing and development in the GSRA. The primary component of the mitigation strategy in each case is the lease stipulations that would apply to new leases.

The level of detail of the analysis included in the SEIS is greater for Region 4 than outside Region 4. Since so little oil and gas activity had occurred outside Region 4, preparing an analysis of impacts to date outside Region 4 would have provided little useful information. Also, the RFD calls for only eighteen wells outside Region 4 over a 20 year period. Due to the lack of information concerning on the location and extent of such development outside Region 4, any analysis of future impacts is highly speculative.

BLM assumed that the surface values of public lands throughout the GSRA are quite similar and that measures developed to protect those surface values in Region 4 would be appropriate throughout the GSRA as well. Therefore, the detailed analysis provided for Region 4 was used as the reasonable basis for leasing decisions outside Region 4. If stipulations from the SEIS were to apply only to Region 4, then all lands outside Region 4 would continue to be available for leasing under the terms of the 1991 FEIS until modified by a subsequent planning effort and preparation of a separate Resource Management Plan Amendment. Based on the low levels of future development assumed in the RFD, there would be little need for BLM to conduct such planning at this time. The earliest such planning might be contemplated is after seventeen more wells are drilled outside Region 4.

Chapter 2, Section 2.2 of the Draft SEIS described the RFD. Please see the comments and responses in Chapter 5, Section 5.4. However, many comments on the Draft SEIS reflected a misunderstanding of the RFD. Additional information is provided here in response to those concerns.

The RFD is the level of oil and gas development activity that an objective reviewer might reasonably expect to occur over the next twenty years. The RFD is not a prediction of future activity but rather an assumed level of future activity. The actual amount of future oil and gas development activity is dependent on many factors, like commodity prices, changes in technology, availability of infrastructure to transport the product, inflation, availability of capital, legislation, and taxes. To attempt to predict such a variety of factors would be extremely difficult and may lead to unrealistic expectations or unfounded public concerns.

Therefore, BLM assumed that the past level of oil and gas activity was the best guide to future activity. The RFD was thus based on the average amount of activity that has occurred in Region 4 over the last five years. During the lsat five years, an average of four drill rigs has been working year round, drilling about fifteen wells each, or a total of 60 per year. At that rate over two years, 1,200 new wells would be drilled. Since, on average, wells drilled on BLM mineral estate make up about 20 percent of the total activity in Region 4, about 20 percent of the 1,200 wells could be expected on BLM. This represents about 230-240 wells. With the recent transfer of the NOSR to BLM and such lands soon to be available for leasing, the percentage of activity on BLM mineral estate would likely increase to perhaps 25 percent of the total. This represents about 300 wells of the 1,200 total. Thus, the number of wells included in the RFD for the NOSR Production Area, 70 wells, is represented by the difference between 230 and 300 wells.

Though well spacing was not a specific factor considered when preparing the RFD, spacing, has been a factor in the industry's operations over the past five years, and is an indirect component of the RFD. For example, since past activity included a trend towards 40 acre or tighter spacing of surface locations, continued development at these spacings would be implied in the RFD. The RFD was not intended to be used for describing the likely future spacing or numbers of wells in a given, local area. Actual development within a given geographic area will be based on many site-specific factors, including the production costs and productivity of individual wells, and such local factors had no bearing on development of the RFD.

The RFD for federal mineral estate outside of Region 4 is 18, as described in the Draft SEIS, Chapter 2, Part 2.2. Since only one well has been drilled on federal mineral estate outside Region 4 in the past ten years, BLM sees no reason to adjust the RFD for lands outside Region 4.

Some reviewers of the Draft SEIS suggested BLM consider an alternative that would reduce the number of wells. It was not an objective of the Draft SEIS to reduce, or increase, the number of wells drilled. The Draft SEIS was prepared, in part, to provide public disclosure of a level of development greater than originally anticipated and prepare a set of management objectives or standard operating procedures that could be used to manage future oil and gas development.

4.2 Climate and Air Quality

During the original review period, *BLM completed an additional analysis of the potential air quality impacts that made use of computerized modeling of emissions from oil and gas development activities, and the dispersion of these emissions in the near-field and the far-field. The following discussion of that analysis replaces Section 4.2 in the Draft SEIS, and Section 4.1 in te FEIS.*

Climate. No significant, adverse impacts to climate are anticipated from implementation of the Proposed Action or Alternatives.

Air Quality. No significant, adverse impacts to air quality are anticipated from implementation of the Proposed Action or Alternatives. Based on a separate assessment (available at the GSRA office) predicting potential future near- and far-field air quality impacts (Notar 1998 and Vimont 1998), localized short-term increases in particulate matter, carbon monoxide, nitrogen dioxide, ozone, and sulfur dioxide concentrations would occur, but maximum concentrations would be well below applicable ambient air quality standards. Similarly, hazardous air pollutant concentrations would be well below the state's Acceptable Ambient Concentration Levels (AACLs), and the related short- and long-term cancer risks to well rig operators and nearby residents would be below significance levels.

The air quality impact assessment is based on the best available engineering data and assumptions, meteorology data, and Environmental Protection Agency (EPA) dispersion modeling procedures. However, where specific data or procedures were not available, "reasonable, but conservative" assumptions were incorporated. For example, the air quality impact assessment assumed that an additional 1,200 natural gas wells (300 on BLM administered lands) would go into production (no "dry holes") within 20 years, then operate at full production levels (no "shut-ins").

Potential air quality impacts were analyzed in order to determine maximum near-field ambient air pollutant concentrations and hazardous air pollutant impacts, as well as to determine maximum far-field ambient air pollutant concentrations, visibility and atmospheric deposition (acid rain) impacts.

Air pollution impacts are limited by state and Federal regulations, standards, and implementation plans established under the Clean Air Act and administered by Colorado Department of Public health and Environment – Air Pollution Control Division (CDPHE-APCD). Colorado regulations require that proposed air pollutant emission sources undergo a permitting review, including dehydrators, separators, and gas compressors. Therefore, CDPHE-APCD has the authority to review emission permit applications and to require emission permits, fees and control devices prior to construction and/or operation. In addition, the United States Congress (through the Clean Air Act, Section 116) authorized local, state and tribal air quality regulatory agencies to establish air pollution control requirements more (but not less) stringent than Federal requirements. Additional site-specific air quality analysis would be performed, and additional emission control measures including Best Available Control Technology (BACT) may be required to ensure protection of air quality resources.

In addition, under FLPMA and the Clean Air Act, BLM cannot conduct or authorize any activity which does not conform to all applicable local, state, tribal and Federal air quality laws, statues, regulations, standards, and implementation plans. Two extensive Air Quality Impact Assessment documents (both near- and far-field impact analyses) were prepared to analyze the potential impacts, and are available for review at the GSRA office (Vimont 1998).

Proposed Action. No violations of applicable state or Federal air quality regulations or standards are expected to occur as a result of direct, indirect, or cumulative project emissions (including construction and operation).

The ISCST3 dispersion model was used with meteorological data measured from 1987 to 1991 at Grand Junction, Colorado, to predict a range of maximum potential concentrations in the vicinity of the emission sources for comparison with applicable air quality standards and Prevention of Significant Deterioration (PSD) Class II increments. The maximum "near-field" air pollutant concentrations occur close to and between well locations; the maximum ground level concentrations would be so close to each well location that adding additional wells throughout the field would not increase the overall maximum concentration. This modeling was performed to quantify potential "reasonable, but conservative" particulate matter (PM_{10}) and sulphur dioxide (SO_2) impacts during construction and carbon monoxide (CO) and nitrogen dioxide (NO_2) impacts during operation.

Construction emissions would occur during road and wellpad construction, well drilling, and well testing. Particulate matter emissions would be minimized by application of water and/or chemical dust suppressants. During completion testing, natural gas would be burned (flared) in order to evaluate productivity of the well, and to allow flowback of completion fluids. Flaring could increase both the level and aerial extent of noticeable odors for up to ten days. However, since the burned natural gas does not contain sulfur compounds, and ambient concentrations would be below applicable air quality standards, potential odors would not have a significant adverse impact.

Maximum potential PM_{10} emissions from traffic on unpaved roads and during wellpad construction were used to determine the maximum 24-hour and annual average PM_{10} concentrations. Maximum emissions would be temporary (i.e., occurring during a 46-day construction period) and would occur in isolation, without significantly affecting neighboring well locations. It was assumed that water and/or chemical dust suppressants would be applied to minimize PM_{10} fugitive dust emissions from wellpad and resource road construction. The control efficiency of watering and/or dust suppressants was computed at 50 percent, at an (assumed) application rate of 0.02 gallons per square yard every eight hours for watering.

The highest maximum direct potential PM_{10} concentrations during construction would be nearly 70 to 123 $\mu g/m^3$ (24-hour road construction) and 110 to 130 $\mu g/m^3$ (24-hour wellpad construction). When added to the second maximum 24-hour PM_{10} background concentration measured at Rifle, these values appear to exceed applicable Colorado and National PM_{10} Ambient Air Quality Standards of 150 $\mu g/m^3$. However, since rural background PM_{10} concentrations are likely to be less than those measured in Rifle, it is unlikely standard exceedances would actually occur. Since these construction emissions are temporary, PSD increments are not applicable.

The predicted maximum 24-hour concentrations overestimate actual expected concentrations because it is assumed the maximum modeled concentrations coincide with the maximum measured background concentrations. However, the meteorological conditions which lead to two maximum situations would be very different and are not likely to coincide in the same location at the same time.

The maximum short-term (three- and 24-hour) and long-term (annual average) SO_2 emissions would occur from drilling rigs and other diesel engines used during rig-up, drilling, and completion operations. These SO_2 emissions would be temporary, occurring during a limited construction period at each well location. The maximum modeled concentrations (including representative background values) would be nearly 112 to 121 $\mu g/m^3$ (three-hour), 37 to 49 $\mu g/m^3$ (24-hour), and nine to ten $\mu g/m^3$ (annual). Therefore, all predicted short- and long-term SO_2 concentrations comply with the restrictive Colorado SO_2 Ambient Air Quality Standards of 695 $\mu g/m^3$, 260 $\mu g/m^3$, and 60 $\mu g/m^3$, respectively. Since these sources are temporary in nature, PSD increments would not apply.

It is conservatively assumed that one million cubic feet of gas per day would be burned in a pit flare at each well up to a maximum period of ten days. At the proposed level of well field development, seldom more than four wells throughout the project area, and rarely more than two wells in close proximity, would be flared at any one time. Based on these assumptions, completion testing at each well would emit up to a total of 1.85 tons of CO, 0.34 tons of oxides of nitrogen (NO_x), and 0.031 tons PM_{10}. Given the temporary nature and low levels of potential emissions, State of Colorado air pollutant emission permits would not be required. Therefore, all predicted completion testing air quality impacts would be less than applicable Colorado and National Ambient Air Quality Standards.

Operation emissions would occur from increased compression requirements and fugitive gas well emissions. It is anticipated that field-wide compression would increase from approximately 19,000 hp to 38,000 hp (at six existing compressor locations), and that proposed wells limit fugitive volatile organic compound (VOC) emissions to 20.0 tons per year (although average field-wide VOC emission would be much less). The assumed linear increase in compression ignores potential efficiencies in scale.

Potential air quality impacts during operations were predicted using a "reasonable, but conservative" well field "patch" with a geometric layout of 25 wells and one 10,563 horsepower compressor engine based on the maximum assumed well location densities (100 wells per 640-acre section, or 200 meter spacing) and the largest proposed single compressor (Rifle). Based on a "reasonably foreseeable" NO_x emissions scenario, where current compressor emission levels are proportionately increased for increased compression horsepower requirements, the maximum near-field air CO, NO_2 and ozone concentrations (including background) would be well below applicable air quality standards.

The maximum direct CO impacts, which would occur due to compressor engine emissions throughout production, were predicted to be nearly 1,520 to 1,584 $\mu g/m^3$ (one-hour) and 463 to 617 $\mu g/m^3$ (eight-hour). When these values are added to the assumed background concentrations (ten and six $\mu g/m^3$, respectively), they become nearly 1,530 to 1,594 $\mu g/m^3$ (one-hour) and 469 to 623 $\mu g/m^3$ (eight-hour), demonstrating compliance with the applicable Colorado and National CO Ambient Air Quality Standards of 40,000 $\mu g/m^3$ (1-hour) and 10,000 $\mu g/m^3$ (8-hour).

Maximum NO_2 impacts during operations were predicted using "reasonably foreseeable" compressor NO_x emission rate. The maximum potential "near-field" NO_2 concentrations were determined by multiplying maximum NO_x concentrations by 0.75, in accordance with standard EPA methodology (Federal Register 60:153, p. 40469, dated August 9, 1995). The maximum predicted direct NO_2 impact was fourteen to seventeen $\mu g/m^3$, which is well below the applicable annual PSD Class II increment of 25 $\mu g/m^3$. When this value is added to the assumed representative background concentration (four $\mu g/m^3$), the resulting predicted maximum total impact is eighteen to 21 $\mu g/m^3$, which is also below the applicable Colorado and National NO_2 Ambient Air Quality Standards for 100 $\mu g/m^3$ (annual).

USDA-Forest Service, Region 2 (Haddow 1998 believes the State of Colorado could permit existing natural gas compressors to be replaced, and additional compressors installed, at NO_x emission rates much greater than are currently in operation. Therefore, at their request, a "high" compressor NO_x emission rate scenario was also analyzed. Since the State of Colorado does not have a statewide BACT requirement, it is possible that all existing and future compressors could be permitted at emission rates much greater than the current emission rates (up to 20.1 gm/hp-hr NO_x as opposed to the current two to four gm/hp-hr NO_x emission rates). Under the "high compressor emission" scenario, the maximum predicted NO_2 direct impact was 90 to 109 $\mu g/m^3$, and the predicted maximum total impact (including background) was 94 to 113 $\mu g/m^3$. Under this high compressor NO_x emission rate scenario, it is possible the Colorado and National Ambient Air Quality Standards and PSD Class II Increments could be exceeded. Although such a replacement is theoretically possible, it is unlikely either the operators would consider, or that the State of Colorado would permit, such a replacement with much dirtier equipment.

In addition, both the states of Utah and Wyoming have limited similar natural gas compressor NO_x emission rates to 1.5 gm/hp-hr. Therefore, a "low" compressor emission rate was also analyzed, and the maximum predicted direct NO_2 direct impact was seven to nine $\mu g/m^3$, and the predicted maximum total impact (including background) was eleven to thirteen $\mu g/m^3$. Therefore, neither the Colorado and National Ambient Air Quality Standards, nor the PSD Class II Increments, are likely to be exceeded.

As stated previously, "NEPA analysis comparison to the PSD Class II increment is intended to evaluate a 'threshold of concern,' and does not represent a regulatory 'PSD Increment Consumption Analysis.'"

Ozone is formed in the atmosphere by a photochemical reaction involving ambient concentrations of VOC and NO_x. Because of this complex photochemical process, a specific ozone nomograph developed from the Reactive Plume Model was used to predict potential impacts (Scheffe 1988). This prediction method first computes a potential VOC to NO_x emission ratio, then uses the nomograph to compare this ratio to potential VOC emissions, ultimately predicting a potential ozone concentration.

At the predicted ratio (2.1:1), the nomograph estimated maximum potential one-hour ozone concentrations of 0.023 parts per million (nearly 46 $\mu g/m^3$). When added to a background ozone concentration of 172 $\mu g/m^3$, the total predicted ozone impact would be 218 $\mu g/m^3$, which is below the applicable Colorado and National Ozone Ambient Air Quality Standard of 235 $\mu g/m^3$. This predicted impact is conservative since the nomograph was developed using meteorological conditions more conducive for forming ozone than would be found in western Colorado.

Maximum hazardous air pollutants (HAP) impacts during operations were predicted for the largest single compressor (n-hexane, benzene, and formaldehyde) and a "co-located" individual well site dehydrator, separator, and storage tank (n-hexane, benzene, toluene, ethyl benzene, and xylene). Since neither the State of Colorado nor EPA have established HAP standards, eight-hour HAP concentrations were predicted using the ISCST3 model and an eight-hour averaging time, and compared to a range of eight-hour state Acceptable Ambient Concentration Levels (AACL). At 200 meters away from the highest emitting compressor station and well, the maximum predicted HAP concentrations are as follows: n-hexane 44 to 83 $\mu g/m^{3;}$ benzene nine to seventeen $\mu g/m^{3;}$ toluene eighteen to 34 $\mu g/m^{3;}$ ethyl benzene one to three $\mu g/m^3$; xylene nine to seventeen $\mu g/m^{3;}$ and formaldehyde seventeen to 22 $\mu g/m^{3}$. As the distance from the emission source increases, the predicted concentrations decrease rapidly.

As summarized in Table 4.2-1, formaldehyde is the only HAP predicted to exceed the lower end of the range of states' AACL.

Table 4.2-1. Hazardous Air Pollutant Modeling Results, 8-Hour Acute Exposures (in $\mu g/m^3$)

Pollutant	Modeled 8-Hour Concentrations	Range of States' AACL
n-hexane	44-83	1,800 $_{\text{FL07}}$ - 4,290 $_{\text{NC02}}$
Benzene	9-17	30 $_{\text{FL07}}$ - 714 $_{\text{NV01}}$
Toluene	18-34	1,870 $_{\text{IN03}}$ - 8,930 $_{\text{NV01}}$
Ethyl benzene	1-3	4,340 $_{\text{ND01}}$ - 43,500 $_{\text{VT01}}$
Xylene	9-17	2,170 $_{\text{IN01}}$ - 4,400 $_{\text{FL04}}$
Formaldehyde	17-22	4.5 $_{\text{FL07}}$ - 71 $_{\text{NV01}}$

Source: EPA (1997a).

- FL04 Florida, Broward County Department of Resource Protection
- FL07 Florida, Pinellas County Air Pollution Control Board
- IN01 Indiana Department of Environmental Management
- IN03 Indiana, Indianapolis Air Pollution Control Division
- NC02 North Carolina, Forsyth County Environmental Affairs Department
- ND01 North Dakota Department of Health, Division of Environmental Engineering
- NV01 Nevada Division of Environmental Protection, Air Quality Control
- VT01 Vermont Department of Environmental Conservation, Air Pollution Control Division

Long-term (70-year) exposures from suspected carcinogenic emissions (e.g., formaldehyde) were used to estimate the latent cancer risk at the nearest residence (200 meters from a well site and compressor). These were calculated from EPA (1997b) unit risk factors for carcinogenic constituents. Two estimates of cancer risk were made: one that corresponds to a Most Likely Exposure (MLE) condition, and one reflective of the Maximally Exposed Individual (MEI). The estimated cancer risks were adjusted to account for duration of exposure and time spent at home.

Under the MLE scenario, the estimated total cancer risk associated with long-term exposure to formaldehyde (from the largest formaldehyde emitting compressor engine) was calculated to be 8×10^{-7}. Under the MEI analysis, the total formaldehyde cancer risk for the inhalation pathway (2×10^{-6}), which corresponds to the lower end of the 1×10^{-6} to 1×10^{-4} threshold range. Therefore, the long-term cancer risk analyses indicate no potential for concern. Given the conservative nature of these analyses, predicted exposures are likely to overstate actual exposures. Finally, at the distances involved, it is unlikely that a residence would be affected by more than one well and compressor engine at any given time (i.e., there would be no cumulative incremental risk).

Finally, in reviewing these predicted impacts, it is important to understand the assumptions made regarding resource development. In developing this analysis, there is a great deal of uncertainty in ultimate plans (i.e., number of wells, equipment to be used, specific locations) for resource development. All of these factors affect air emissions, as well as predicted air quality impacts. This analysis was based on a "reasonably foreseeable" development scenario, including the number of wells, well spacing, equipment necessary, and assumed emission rates. Thus, the projected impacts represent a conservative, upper estimate of potential air quality impacts.

It is important to note that before development could occur, CDPHE-APCD would review specific air pollutant emissions preconstruction permits which examine potential project-wide air quality impacts above statutory minimum levels. As part of these permits (depending on source size), CDPHE-APCD could require additional cumulative air quality impacts analysis. Thus, as development occurs, additional site-specific air quality analyses would be performed to ensure protection of air quality resources.

Continuation of Current Management Alternative. Predicted air quality impacts would be the same as described under the Proposed Action above.

Maximum Production Alternative. Although this Alternative establishes a quarter mile (approximately 400 m) buffer around residences and requires the operator to conduct air quality monitoring if necessary, predicted air quality impacts would be essentially the same as described under the Proposed Action above, although the formaldhyde MEI Cancer Risk would be reduced.

No Action Alternative. Implementation of the No Action Alternative would eliminate the incremental air quality impacts associated with the Proposed Action and alternatives. However, continuing impacts from existing sources, as well as additional impacts to air quality from sources already permitted but not yet operational, would occur.

Cumulative Impacts. The CALMET/ CALPUFF dispersion model was used with meteorological data measured during 1990 at Grand Junction, Colorado, plus ten nearby Remote Automatic Weather Stations, and 39 National Cooperative Observer Network precipitation stations. The CALMET/ CALPUFF predicted maximum potential "far-field" cumulative air quality impacts at downwind PSD Class I wilderness areas to: a) determine if the PSD Class I NO_2 increment might be exceeded; b) calculate potential nitrate and sulfate deposition (and their related impacts) in sensitive lakes; and c) predict potential impacts to regional visibility.

Potential emissions from other "reasonably foreseeable" facilities, which were not represented by the measured "background" values, were combined with the Proposed Action to determine the overall potential cumulative air quality impacts. The only additional source identified was the proposed American Soda processing facility to be located at Parachute, Colorado.

As shown below, all cumulative direct NO_2, PM_{10} and SO_2 impacts under the "reasonably foreseeable," "high," and "low" compressor NO_x emission rate scenarios, would be well within applicable Class I increments at the PSD Class I Flat Tops Wilderness Area. It should be noted that this comparison is not a complete PSD increment consumption analysis, but an assessment indicating that the increment would not be exceeded by the cumulative emission sources. At the time of a preconstruction air quality permit application, CDPHE-APCD may require a much more detailed PSD increment consumption analysis.

Table 4.2-2. Predicted Cumulative PSD Class I Wilderness Area Impacts (μg/m^3)

Pollutant	Averaging Time	Direct Modeled (a/)	Class I Increment	Measured Background	Total Predicted	Ambient Air Quality Standards	
						Colorado	National
Low NO_x Compressor Scenario							
• NO_2	Annual	.04	2.5	4	4	100	100
High NO_x Compressor Scenario							
• NO_2	Annual	0.13	2.5	4	4	100	100
"Reasonably Foreseeable" NO_x Compressor Scenario							
• NO_2	Annual	0.04	2.5	4	4	100	100
a/	Only the "Direct Modeled" concentrations should be compared to the PSD Class I increments; only 0.015 μg/m^3 of direct modeled NO_2 impacts, and none of the PM_{10} and SO_2 impacts, are attributable to the Proposed Action alone.						

Cumulative annual atmospheric deposition at the PSD Class I Flat Tops Wilderness area was predicted to be 0.015 kilograms per hectare-year (kg/ha-yr) nitrogen from the proposed Action and 0.06 kg/ha-yr under the "high compressor NO_x emission rate scenario (as requested by the USDA-Forest Service, Region 2), compared to terrestrial ecosystem threshold value of three kg/ha-yr. While not specifically modeled, impacts at the PSD Class I Eagles Nest, Maroon Bells-Snowmass, and West Elk Wilderness Areas, and the PSD Class II Holy Cross, Hunter-Frying Pan, and Raggeds Wilderness Areas would be less than those described for the PSD Class I Flat Tops Wilderness Area.

Since the proposed emissions constitute many small sources uniformly spread out over a very large area, discrete visible plumes are not likely to impact the PSD Class I Flat Tops or other wilderness areas, but the potential for cumulative visibility impacts (increased regional haze) is a concern. Regional haze (visibility) degradation is caused by fine particles and gases scattering and absorbing light. Changes to regional haze are measured in terms of perceptible visibility (1.0 deciview) differences from existing ambient background conditions.

The Interagency Workgroup on Air Quality Modeling (IWAQM) has prepared a methodology for estimating changes to regional haze (IWAQM 1993). This method involves modeling NO_2, PM_{10} and SO_2 emissions to estimate airborne fine particle concentrations at the PSD Class I area, then computing an increase in extinction coefficient (interpreted as a deciview change) in addition to "clear" (20 percent cleanest days) measured background conditions.

A 1.0 deciview change is considered potentially significant as adopted by the Grand Canyon Visibility Transport Commission and reported in Pitchford and Malm (1994) and is defined as about a ten per cent change in extinction coefficient, which is a small but perceptible scenic change under many circumstances. The 1.0 deciview value corresponds to a two to five percent change in contrast, for a "black target" against a clear sky, at the most optically sensitive distance from an observer. Factors such as the magnitude of deciview change, frequency, time of the year, and the meteorological conditions during times when deciview thresholds are above 1.0 (as well as inherent conservatism in the modeling analyses) should all be considered when determining the significance of potential impacts.

A visibility screening level analysis predicted that operations would not result in a perceptible (1.0 deciview reduction) visibility impact at any of the PSD Class I wilderness areas under either the "reasonably foreseeable" or "low" compressor NO_x emission rate scenarios. However, under the "high" compressor NO_x emission rate scenario, a perceptible visibility impact could occur at all Class I PSD wilderness areas throughout the study area on days exceeding the 20 percent cleanest day extinction value of 16.69 Mm^{-1}.

In addition, the USDA-Forest Service, Region 2, has established a 0.5-deciview "Limit of Acceptable Change" to evaluate potential significant visibility impacts at the PSD Class I Flat Tops Wilderness Area. Based on this more restrictive 0.5-deciview level, the Proposed Action is predicted to exceed the USDA-Forest Service "Limit of Acceptable Change" under the predicted first- and second-maximum 24-hour predicted impacts. Under the low compressor NO_x emission rate scenario, the 0.5 deciview level would be exceeded on only the first-maximum 24-hour predicted impact.. The BLM performed the analysis of potential visibility impacts at the 0.5 deciview level at the request of the USDA-Forest Service, Region 2, not based on any legal requirement, and any predicted visibility impacts below 1.0 deciview "just noticeable change" threshold would not be perceptible.

This regional haze analysis was conducted using conservative assumptions regarding emissions, plume transport time, humidity, and the conversion of NO_x to ammonium nitrate. It was assumed all of the NO_x would convert to NO_2, that 40 percent of the NO_2 would convert to NO_3, and that all of the NO_3 would convert to ammonia nitrate particles. In all likelihood, the amount of NO_x that converts to ammonium nitrate particles would be significantly less. Based on numerous "reasonable, but conservative" analysis assumptions, the 1.0 deciview "just noticeable change" threshold level is not likely to occur at the PSD Class I Flat Tops Wilderness Area from the Proposed Action or alternatives. While not specifically modeled, impacts at the PSD Class I Eagles Nest, Maroon Bells-Snowmass, and West Elk Wilderness Areas, and the PSD Class II Holy Cross and Raggeds Wilderness Areas would be less than those described for the PSD Class I Flat Tops Wilderness Area, except under the "high" compressor NO_x emission rate scenario.

Finally, in reviewing these predicted impacts, it is important to understand the assumptions made regarding resource development. In developing this analysis, there is a great deal of uncertainty in ultimate plans (i.e., number of wells, equipment to be used, specific locations) for resource development. All of these factors affect air emissions, as well as predicted air quality impacts. This analysis was based on a "reasonably foreseeable" development scenario, including the number of wells, well spacing, equipment necessary, and assumed emission rates. Thus, the projected impacts represent a conservative upper estimate of potential air quality impacts which are unlikely to be reached.

It is important to note that before development could occur, CDPHE-APCD would review specific air pollutant emissions preconstruction permits which examine potential project-wide air quality impacts above statutory minimum levels. As part of these permits (depending on source size), CDPHE-APCD could require a cumulative air quality impacts analysis. Thus, as development occurs, additional site-specific air quality analyses would be performed to ensure protection of air quality resources.

Unavoidable Adverse Impacts. Some increase in air pollutant emissions would occur as a result of the Proposed Action and alternatives; however, based on the "reasonable, but conservative" modeling assumptions, these impacts are predicted to be below applicable significance thresholds.

Incomplete and Unavailable Information. As described previously, the BLM assessed potential direct, indirect and cumulative air quality impacts from the Proposed Action and reasonable alternatives, in addition to the existing air quality (measured background) conditions, then compared these total potential impacts to existing legal requirements and other scientifically defensible threshold levels in order to disclose potential significant, adverse impacts to the public, governmental agencies, and the BLM "decision maker," before a "Record of Decision" is issued either denying, approving, or approving with stipulations any of the alternatives analyzed.

Given the speculative nature of the Proposed Action and alternatives, definitive information is not always available, and it is necessary to make "reasonable, but conservative" assumptions to assure any significant, adverse impacts would be disclosed. However, when several "reasonable, but conservative" assumptions are combined in the overall analysis, the resulting predicted impacts will overestimate the actual conditions that would occur.

The inclusion of secondary organic aerosol impacts in the visibility analysis was not considered to be "reasonable," and therefore not included in the air quality impact assessment. Based on a review of the current (but insufficient) documentation and research of potential visibility impacts in urban areas due to secondary organic aerosols, such as the Los Angeles basin studies of Pandis, et al (1992) and Grosjean (1984, 1985), the rural setting of western Colorado is not conducive to such photochemical reactions. At present, organic aerosol formation processes are not well understood, and current modeling techniques are not available for estimating visibility degradation. Although some organic carbon aerosols sampled at Interagency Monitoring of Protected Visual Environments (IMPROVE) monitoring site exhibit a connection to observed visibility measurements, these organic carbon data are the most uncertain of the IMPROVE measurements, and do not identify specific organic compounds. The IMPROVE monitoring network is not designed to determine the source (natural or anthropogenic) or chemical composition of the sampled compounds; therefore, the data necessary to evaluate potential visibility impacts from VOC in western Colorado (as opposed to the Los Angeles Basin) are not available. The necessary methods to predict potential visibility impacts from secondary organic aerosols may become available in the future through ongoing visibility-related research. However, estimation of potential visibility impacts due to secondary organic aerosol formation is not currently supported by credible scientific evidence, and therefore was not included in this air quality impact assessment.

4.3 Vegetation

This Section supplments the discussion of Vegetation of in the FEIS, Chapter 4, page 4-1.

4.3.1 Riparian and Wetlands

Development in or near the riparian area has detrimental impacts on the riparian habitat and those wildlife species associated with it. Throughout the resource area, the functions and values of much of the riparian habitat have been directly and indirectly impacted by road construction, cultivation, water diversions, impoundments, gravel extraction, livestock grazing and construction of gas wellpads and facilities.

Riparian impacts can be described in terms of direct and indirect impacts. Direct impacts include removal of riparian vegetation, physical loss of wildlife habitat, increased sedimentation from surface disturbance or bank erosion, and changes in channel morphology. Indirect impacts include a decline in macroinvertebrates, fish and amphibians due to siltation of gravel beds and spawning areas and reduction in the usability of riparian habitat as wildlife is displaced due to human activity.

Stream crossings or disturbances that encroach upon the riparian vegetation itself may adversely affect the physical functioning of the stream. Stream hydrology may be altered, bank erosion may increase, additional sediment may enter the channel creating impacts to the aquatic habitat and water quality downstream. Riparian vegetation is lost and this decreases the ability of the riparian area to trap sediment and nutrients, to moderate floods, and to provide food and cover for terrestrial and aquatic wildlife.

Surface disturbances adjacent to the riparian area may also adversely affect the physical functioning of the riparian area, primarily due to increased runoff and sediments entering the riparian area. The amount of increased runoff is proportional to the amount of soil and vegetation disturbed and the degree of slope. Loss of ground cover decreases infiltration of water and increases surface runoff. Severe loss of ground cover may result in the formation of pedestals, rills and gullies that greatly concentrate runoff, increase peak flows, and damage streams. Increased runoff is greatest where ground cover is removed and soils are compacted, as with roads and pads. (Maxwell, CRA, 1995).

Impacts to localized aquatic habitat would result from increased sedimentation. Sediment would cover gravel beds on the stream bottom, resulting in loss of habitat for macroinvertebrates which serve as the primary food source for most fish species. In addition, gravel beds serve as spawning areas and are necessary for successful reproduction by many fish species.

The adjacent uplands are valuable to wildlife because they provide additional forage in close proximity to nesting and hiding cover. Research indicates that the habitat adjacent to and in close proximity to riparian areas is also important nesting habitat for ground-nesting birds and other species. Since predators often follow the riparian corridor in search of prey, birds and small mammals tend to move into the immediately adjacent habitat for nesting and raising of young.

The influence of human activities along roads and wellpads has an indirect impact beyond the physical extent of the development. Even though riparian habitat may not be physically lost or altered, the usability of the habitat for wildlife may be diminished. Wildlife exposed to increased human activity, equipment operation, vehicle traffic and noise often avoid or move away from these types of disturbances to other habitat areas. This avoidance is referred to as displacement, and would result in underuse of habitat near the disturbance. This displacement reduces habitat usability and the capacity of affected acreages to support wildlife.

The distance wildlife would move to avoid the activity varies by wildlife species, topography and the degree of vegetative cover, as well as the time of year and the amount and type of traffic. Fish and amphibians might only be affected by activities within five to six meters beyond the extent of actual physical disturbance. Songbirds might be affected by activities within 75 to 100 meters. Species which are more sensitive to human disturbance, such as mountain lion and black bear, might be affected by activities within 800 meters, whereas more adaptable species like mule deer may only be affected by activities within 200 meters.

Displacement is most severe during the construction phase of the oil and gas activity, but the effect may also continue to a lesser extent for the life of the wellpad due to human activity associated with regular visits to the wellpads. This is especially true during critical times of the year such as nesting/production (birthing) and rearing of young. Average use of habitat is expected to increase gradually with distance from roads and facilities.

For the purpose of this analysis, an impact zone of 152 meters (500 feet) on either side of the development was selected. Thus a road 500 feet away which might disturb nesting birds due to occasional vehicle traffic would be considered an impact, as well as a road 30 feet away which may increase sediment entering the stream, affecting water quality and fish habitat.

See Section 3.5, Wildlife, for additional discussion of displacement impacts.

4.3.2 Impacts To Date

BLM Impacts to Date. As of late 1997, there were 160 oil and gas wells on BLM-managed lands. As shown on Table 4.3-1, these 160 wells have adversely affected 101 acres of riparian areas on BLM and privately owned land. (In this analysis, all the impacts of a road to a gas well on BLM-administered mineral estate are attributed to that well, including those on private property.) In addition to the indirect impact of roads, 20 stream crossings are attributable to development of BLM oil and gas resources. Each stream crossing causes a direct loss of riparian vegetation, an increase in stream sedimentation and the disruption of habitat function and value.

On BLM-managed lands, 54.5 percent of the riparian areas have been affected by all variety of impactors.

Less than 200 acres of riparian areas on public lands have not been directly or indirectly affected by human development. (Table 4.3-1).

The largest remaining tracts of unaffected riparian areas on BLM managed land are found on:

- the East Fork and East Middle Fork of Parachute Creek on the Roan Cliffs;
- small tracts of public land along the Colorado River;
- Dry Creek;
- the upper reaches of tributary streams to the main Parachute Creek; and
- the upper end of Hayes Gulch and Cottonwood Gulch.

This list does not include all the remaining unaffected riparian areas, only the largest tracts. However, these are the largest contiguous parcels, in many cases the upper portions of watersheds which are currently unroaded, and they each contain late-seral riparian vegetative communities, consisting of mature cottonwoods, willows, and various herbaceous species. The diversity of vegetation and community structure provides some of the most important wildlife habitat in the Region. These late-seral riparian areas are generally more important wildlife habitat than the early-seral sedges and rushes or thin isolated patches of willows, because of the greater diversity of habitat niches available. The cottonwoods provide valuable nesting sites for raptors, willows provide nesting habitat for numerous non-game birds, and the willows and cottonwoods provide food and cover for terrestrial and aquatic wildlife, as well as visual screening of human activities.

Table 4.3-1 Riparian Acreages and Impacts by Land Ownership

STATUS	Total Riparian		Riparian Affected by All Roads			Riparian Affected by BLM O&G Roads		
	Acres	%	Acres	% Land by status	% Total Affected Acres	Acres	% Land by status	% Total Affected Acres
BLM	182	5.2	95	52.2	6.6	16	8.8	15.8
NOSR	126	3.6	47	37.3	3.2	0		
NOSR Production Area	10	0.3	6	60.0	0.4	4	40.0	4.0
Split Estate	113	3.2	87	174.0	6.0	7	7.0	6.9
Total BLM	**431**	**12.2**	**235**	**54.5**	**16.2**	**27**	**6.3**	**26.7**
FOREST	196	5.6	91	46.4	6.[illegible]	2	1.0	2.0
Total Federal	**627**	**17.8**	**326**	**52.0**	**22.5**	**29**	**4.6**	**28.7**
State	31	0.9	26	83.9	1.8	0		
Private	2867	81.3	1098	38.3	75.7	72	2.5	71.3
Grand total	**3525**	**100.0**	**1450**	**41.1**	**100.0**	**101**	**2.9**	**100.0**

Another riparian area which is largely unaffected by development is upper Porcupine Creek. However, Porcupine Creek is in a naturally highly erosive watershed. A tremendous amount of rock and debris is transported in the stream channel, which has created steep, raw stream banks and very little riparian vegetation. The riparian values of this stream are not considered a high priority for protection. However, surface disturbance in the proximity of the drainage should be strictly controlled because the lack of riparian vegetation to filter incoming sediment increases the possibility that offsite sedimentation will enter the stream channel.

Some riparian areas indicated in the analysis as "impacted" by roads or pads may not be severely impacted yet. Several of the roads included in the analysis are very rough two-track trails which are used only infrequently for grazing administration and hunting access. As long as the access remains unchanged, these streams will retain most of their riparian values. Examples of these streams would include Wallace Creek and the lower part of Dry Creek.

Disruption of riparian zone function caused by oil and gas development on BLM-managed mineral estate has amounted to only 27 acres, about six percent of all the BLM riparian zone. However, the total amount of BLM riparian zone that has been affected by all type of activities is substantial, 235 acres, or more than half the total. The amount of disruption to date makes it important that disruption of the remaining unaffected riparian zone, whether by oil and gas development or by other activities, be minimized. Disruption can be minimized by avoidance or by careful project design and implementation.

Cumulative Impacts to Date. Since data on oil and gas roads on private land are limited, the effect of those roads is extrapolated from the data on BLM oil and gas development. The assumption is that impacts on private land are similar in nature and extent to impacts on public land. If 160 wells on federal mineral estate contributed to 101 acres of riparian impact, then the total of 700 wells drilled in Region 4 has impacted 442 acres. This represents 12.5 percent of the total riparian vegetation in Region 4. In fact, the riparian acreage affected by oil and gas activity on private land could be proportionately greater since there is proportionately more riparian on private lands. (Private lands encompass more riparian areas and therefore roads and wellpads on private land are more likely to impact riparian than on public land which has fewer riparian acres.)

There are an estimated 645 stream crossings in all of Region 4, 20 attributable to development of oil and gas resources on federal mineral estate. Each stream crossing causes a direct loss of riparian vegetation, an increase in stream sedimentation and the disruption of habitat function and value.

Oil and gas activities have probably caused little impact to riparian areas in Region 4 when compared to other types of human disturbance. For instance, the construction of I-70 and the D&RGW railroad has narrowed the riparian zone along the Colorado River floodplain. In addition, many agricultural practices and housing developments have affected riparian areas. An estimated total of 1,450 acres of riparian habitat have been directly or indirectly affected by all roads through 1997. This means 41.1 percent of the riparian areas in Region 4 have reduced effectiveness because of the proximity of roads.

These figures probably underestimate the total impact on the riparian zone because we do not have complete data for all the impacts occurring on private land, such as housing development, agricultural and commercial development, road and railroad construction, and oil and gas activities. It is likely that in total, more than 50 percent of all the riparian areas in Region 4 have already been lost or their function and values diminished. The largest remaining tracts of unaffected riparian areas on non-BLM land include:

- the Colorado River between DeBeque and Parachute;
- islands in the Colorado River;
- upper Battlement Creek; and
- the USFS creeks on Battlement Mesa.

Although oil and gas development represents only a small portion of this total habitat loss or impairment, it is an impact which can be avoided or mitigated to minimize further loss of riparian values.

4.3.2 Future Impacts

4.3.2.1 Continuation of Current Management

The 1991 FEIS created a No Surface Occupancy (NSO) stipulation to protect a one-half mile buffer around major river corridors and a Controlled Surface Use (CSU) stipulation to confine surface disturbance on smaller streams and bodies of water beyond the extent of the riparian vegetation. Under the CCM Alternative, these stipulations would be applied to any new leases but their application to existing leases would be voluntary. (FEIS, p.4-4) See Appendix A for a description of stipulations that apply under the CCM.

For streams other than the major rivers, the CSU stipulation provides only for the avoidance of the actual riparian vegetation itself. This does not take into account the effects of a road or pad immediately adjacent to a riparian zone. Depending on the width of the riparian area, the type of vegetation and the surrounding topography, disturbance within 500 feet of the riparian area may diminish the usability of the habitat or cause increased sedimentation and siltation of the stream itself. If the surrounding slopes are steep or the soils erosive, and if the riparian vegetation is not wide enough to filter all the incoming sediments, the excess erosion may enter the stream channel and cause a degradation of water quality.

As described in 4.1, Introduction, most BLM oil and gas leases in effect in Region 4 operate under Standard Terms and Conditions rather than the stipulations determined in the FEIS because they were issued prior to the completion of the FEIS. Mitigation applied to development activities on active leases must be consistent with lease rights granted unless the lessee or operator voluntarily incorporates such measures. However, the GSRA has attempted to work within the constraints of the old leases to mitigate impacts and to encourage voluntary mitigation where possible. Post-lease COAs have been used to reduce the loss of riparian habitat values. Some of the efforts to date have included: minimizing overall wellpad size as much as possible, rounding pad corners to avoid placing fill material in an adjacent drainage, placing pipelines in the road right-of-way, moving wellpads and roads to the flattest terrain possible, while trying to avoid placing those facilities in the riparian zone, and developing a reclamation policy to clearly articulate our standards for reclamation.

Existing leases do not include any special stipulations for the protection of riparian zones. The Standard Terms and Conditions allow relocation of the pad up to 200 meters; however, due to the frequent juxtaposition of steep slopes and riparian areas in Region 4, relocating proposed gas wells and roads may often lead to a tradeoff between constructing in a riparian zone or building on steep slopes.

In the past, this tradeoff has often led to management decisions to place the disturbance in or within 100 feet of the riparian zone. Past development has generally occurred on the less challenging sites. As development proceeds and well density increases, proposed sites may become more challenging. New proposed sites may encroach further upstream into steep, previously undisturbed canyons. On the other hand, as the density increases, there is the likelihood that less riparian impacts will occur in the future because in many cases the road infrastructure is already in place and new pads can be accessed without additional stream crossings and without building new roads and pads in the vicinity of riparian areas. Also as density increases, industry may voluntarily choose to collocate some pads and employ directional drilling to extract the resource.

Hence, it is reasonable to assume that, without further lease stipulations, approximately the same proportion of future locations will be built in riparian areas. Assuming the same proportion, we can estimate the amount of riparian acreage that will be impacted for the life of the plan at about 189 acres, an additional five percent of riparian habitat, bringing the total acreage directly affected by development on federal mineral estate to about eight percent.

4.3.2.2 Maximum Protection Alternative

The primary difference between the Maximum Protection Alternative and the Continuation of Current Management is in the environmental constraints which would apply to any new leases. The Maximum Protection Alternative protects riparian values on new leases with a No Surface Occupancy (NSO) stipulation within 500 feet of riparian areas. Since most of Region 4 is already leased, the only areas where this stipulation would legally apply are new leases, such as those in the NOSR Production Area. This area contains only two sizeable riparian areas, one in Hayes Gulch and the other in Cottonwood Gulch. Application of this stipulation would provide more protection for these riparian areas, but would have limited impact on overall oil and gas development because of the small amount of riparian zone in the NOSR Production Area. See Appendix B for a full description of the lease stipulations that would apply under the MP Alternative.

With the exception criteria identified, there will continue to be some surface disturbance within 500 feet of riparian areas and even some additional loss of riparian vegetation. Although additional stream crossings may occur, the incremental increase would likely be minimal with the application of appropriate mitigation, especially if it is developed in the context of an area plan that addresses transportation and infrastructure. The stipulations included under this alternative give BLM authority to protect the highest value riparian areas and to mitigate most of the adverse impacts on all riparian areas.

On existing leases, compliance with the new stipulations would be voluntary. Riparian areas may be protected to a lesser degree with the use of the Standard Terms and Conditions which allow a move of up to 200 meters to protect resource values. In addition, COAs may be attached to the APDs to mitigate impacts as long as they do not interfere with the rights granted under the lease. The COAs identified to protect riparian areas include: a) stream crossings will be kept to the absolute minimum and will be located where riparian values are the lowest, b) replanting of native riparian vegetation may be required, and c) installation of sediment traps may be required to protect water quality.

Mitigation efforts could be improved by requesting the oil and gas development companies to submit an area plan prior to constructing multiple wells in a concentrated area. This would allow BLM to design a transportation system and optimum well locations for a whole series of wells to minimize adverse resource impacts. The piecemeal approach of addressing impacts on a pad-by-pad basis may not actually minimize the number of wellpads and the amount of new road construction required.

Planning future development to limit the number of riparian crossings would diminish impacts. Where crossings are unavoidable, design crossings to minimize the extent and value of riparian vegetation disturbed; design culverts so they do not obstruct stream flow or change stream gradient.

If large areas of riparian vegetation are disturbed, effective mitigation may require replanting with native riparian species appropriate for the site. This may include planting willow plugs, cottonwood poles, and clumps of herbaceous riparian species.

4.3.2.3 Proposed Action

The Proposed Action lease stipulations that would apply to new leases are found in Appendix C. The differences between the Proposed Action and the Maximum Protection Alternative are that the Proposed Action provides for No Surface Occupancy (NSO) on the riparian vegetation only. The adjacent habitat (a 500 foot buffer) is protected by Controlled Surface Use (CSU), which requires special design features. Exceptions to the NSO may be granted for stream crossings or for other activities if the Authorized Officer (AO) determines that any riparian vegetation lost can be replaced within three to five years.

This alternative provides less protection for riparian habitat than the Maximum Protection Alternative. A higher percentage of riparian values will be lost because of facilities that may be sited within this zone. However, under this alternative, the AO has the authority to protect the highest value riparian areas and to minimize impacts to other riparian areas. These stipulations will only apply to new leases, such as those granted in the NOSR Production Area. Applying these stipulations to the limited riparian resources in the NOSR Production Area should protect the riparian values while having minimal impact on oil and gas development.

On existing leases, compliance with the new stipulations would be voluntary. As discussed in the Maximum Protection Alternative, riparian areas may be protected to a lesser degree with the use of the Standard Terms and Conditions and by adding certain COAs to APDs. These COAs may include: a) minimizing the number of stream crossings and locating those crossings where riparian values are the lowest, b) replanting native riparian vegetation to restore site function, and c) installing sediment traps to protect water quality.

Although impacts are expected to be slightly greater than under the Maximum Protection Alternative, overall impacts are still thought to be small. There would be some unavoidable loss of important riparian habitat in localized areas.

4.3.2.3 Preferred Alternative

The Preferred Alternative for riparian and wetland zones is the same as the Proposed Action, an NSO on the riparian vegetation and a CSU on a 500 foot buffer adjacent to the riparian vegetation. Impacts of this alternative will be the same as those for the Proposed Action.

4.3.3 Cumulative Impacts

An additional 1,200 wells are projected to be drilled in the next 20 years in Region 4. If future gas development impacted the same proportion of riparian areas as in the past, this would create a total of 1,199 acres of impacted riparian areas. This represents approximately 34 percent of all riparian areas in Region 4.

Activities other than oil and gas development will also affect riparian areas in Region 4 in the coming years. Continued housing development is expected. Some of this development will likely occur within the riparian zones. Future water developments and diversions may drain water from streams and alter or destroy the riparian community.

4.4 Livestock Grazing

The Livestock Grazing portion of the Environmental Consequences section was discussed on pages 4-2 and 4-3 of the FEIS. A preliminary evaluation of the impacts of oil and gas development on livestock grazing since the publication of the FEIS indicated that no additional discussion was necessary.

4.5 Wildlife

This Section supplements the discussion of wildlife included in the FEIS, Chapter 4, pages 4-3 to 4-10.

4.5.1 Introduction

Some of the impacts expected to occur from gas development in the GSRA are discussed on pages 4-3 through 4-10 of the FEIS. This SEIS focuses on Region 4, which contains most of the gas development activity expected to occur in the GSRA. The discussion in this section is supplemented in many instances by more detailed information found in Appendix G of the Draft SEIS.

Currently, most of the gas development in Region 4 has been concentrated in the central portion, an area encompassing 183,012 acres, with some scattered development outside this area. See the well locations displayed on Map 1-2. Assuming the current rate and location of development will continue, 92 percent of the future gas development activities would be clustered within this area. To date, 160 of the 700 wells drilled in Region 4 have been drilled on BLM-managed minerals. The Reasonable Foreseeable Development (RFD) used in this analysis assumes an additional 300 wells on public mineral estate in the next 20 years, 1,200 wells overall on both public and private mineral estate.

Wildlife are affected differently during each phase of gas development - construction, operation and abandonment. The ***construction*** phase includes preconstruction permitting and siting of facilities; construction of wellpads, pipelines, electrical utilities, produced water disposal facilities, and compressor stations; construction or improvement of access roads; and drilling and completion of gas wells. These activities require numerous personnel and equipment. They typically occur at each well over a period of 25-40 days. Reclamation on about 50 percent of the area disturbed by construction would begin immediately. The remainder of the area disturbed would be occupied by aboveground facilities for the life of the project. Successful reclamation for weed and erosion control is expected to occur within three to five years after disturbance; however, restoring to productive wildlife habitat could take up to 20 years.

Gas production, treatment, collection, compression, and produced water disposal take place during the period of ***operations***. These typically involve minimal personnel in the field except at compressor stations and water disposal facilities and traffic to each well for monitoring and maintenance. Although human activity is less than during construction (except during "workover" periods), it continues throughout the year. The activities having the greatest effect on certain species of wildlife occur during the winter, associated with regular visits to the wellpads for facility maintenance, daily monitoring, produced water removal, road maintenance and snow removal, and increased use of the area by the public. Impacts result from vehicle use, the presence of humans and dogs (game animals are immediately stressed, once a human or dog form can be distinguished from a vehicle, regardless of whether there is an attempt to harass) and illegal hunting. Occasional recompletion efforts have an effect similar to that of construction.

Abandonment occurs at the end of a well's productive life, thought to be 20-30 years in Region 4; there are, however, currently producing wells in the 40-50 year age range. At the end of the operational life of each well, facilities are removed, wells are plugged and access roads reclaimed, unless the roads are deemed necessary for resource management or if requested by the landowner. These activities involve a short-term increase in people and vehicles in the project areas. Abandonment and reclamation activities require approximately three days per well and four days per mile of access road, for a crew of four people.

4.5.2 Direct and Indirect Impacts

The following general discussion of the direct and indirect impacts of gas development in Region 4 on big game, raptors, and other species of concern, is intended to lay the foundation for the discussion of impacts for the Proposed Action and alternatives. Development on BLM-managed minerals has only a small direct effect on all habitats, generated primarily by the surface disturbance required for wellpads, roads and pipelines. However, construction and operation disturbances emanating from these areas reduce habitat effectiveness for wildlife in a much larger surrounding area. These disturbance zones vary in width depending on a number of factors, including intervening terrain and vegetation, the type and duration of the disturbance, the species of wildlife present, and the time of year.

Big Game

Big game species in Region 4 include mule deer, elk, bighorn sheep, black bear and mountain lion. Direct and indirect effects on these species could occur during each project phase, but the magnitude of effects would vary depending on the type of activities, the species affected, and the seasonal sensitivity of the species and its habitat. Elk and mule deer are the big game most adversely affected by the development in Region 4 under all alternatives. Adverse effects are primarily associated with disturbances on, and displacement from winter ranges. In the area of concentrated development, approximately 85 percent is classified as mule deer winter range, 50 percent as mule deer severe winter range, 50 percent elk winter range and 25 percent elk severe winter range.

Mountain lion are sensitive to disturbance, but are more likely to be affected by their link to their prey base. Mountain lion tend to follow mule deer and elk herds as these two species are the primary source of food; thus as deer and elk populations move or decline, so do mountain lion populations. The mountain lion population base is much smaller and it takes longer to recover from a decline.

Black bear are wide-ranging, long-lived and reproduce at a late age. They are sensitive to overharvest, human disturbance and illegal harvest, which are all related to increased road density and access. They recover from population declines very slowly. They are more habitat specific and have a smaller population than other big game species. Black bear will be relatively unaffected unless road densities should increase in their fall feeding areas. Any activity that provides an attraction to food or garbage could adversely affect bears.

Bighorn sheep will only be minimally impacted as most gas development will be located outside of their seasonal ranges and they will receive no further discussion.

Direct Impacts. During the ***construction phase***, the most important direct impact is the habitat loss resulting from construction of facilities (wellpads, roads, pipelines, compressor stations and storage yards). About 50 percent of the disturbed area should be reclaimed within a 3-5 year period; however, revegetation sufficient to return the disturbed area to fully productive wildlife habitat (proper species composition, diversity, and age) could require up to 20 years. The remaining 50 percent of the affected area would be occupied by the working surface of wellpads, roads, and other facilities, and would represent a long-term habitat loss. During the ***operational phase***, the direct impact would continue, unless offset to some extent by enhancement of other habitat. In addition, during "workover" periods, some of the revegetated portions of the pad would be disturbed again. The ***abandonment phase*** would primarily have positive direct impacts by the removal and reclamation of facilities. There would be some habitat loss as the pads and roads are being reclaimed. This is expected to be minimal and relatively short lived.

During ***all phases*** of development, the increased network of roads and associated traffic will increase mortality and injury from big game collisions with vehicles, illegal hunting, legal hunting and harassment from people and dogs.

Direct impacts may be offset to some degree by mitigation efforts that either improve habitat or segregate it from further impacts. A recent example of the former occurred in GMU 42, where an operator purchased 320 acres of deer and elk winter range and implemented habitat improvements in terms of vegetation treatment, riparian fencing and ditch repair and water development. This effort will help to offset the loss of big game winter range due to surface disturbing activities.

Indirect Impacts. The greatest impact on wildlife, especially big game and raptors, is the disturbance caused by increased human activity, including people movement, equipment operation, vehicle traffic, harassment by dogs and noise related to wells and compressor stations. In this case, the physical alteration of habitat is not the issue, but the presence of these activities. Wildlife are relatively secretive, and distance themselves from these types of disturbance or move to entirely different areas sheltered by vegetation screening or topographic features. This avoidance is referred to as displacement and results in underuse of habitat near the disturbance. Disuse of forage and cover resources adjacent to disturbance reduces habitat utility and the capacity of the affected acreage to support wildlife populations.

Oil and gas road networks are of particular concern as they often remain open to unregulated use throughout the life of the well and beyond. "It is assumed that avoidance-related disuse, in most situations, accounts for up to 50 percent of potential forage and cover use within 300 feet of a road in heavy cover types, and 600 feet in open situations. Big game avoidance is considered minor at road densities of 1.5 miles per square mile or less (about ten percent loss of habitat effectiveness). As road density increases, the influence on habitat effectiveness increases exponentially, such that at road densities of three miles per square mile, habitat effectiveness is reduced by about 30 percent." (White River Resource Area RMP/EIS). Average road density in the area of concentrated development in Region 4 is currently about three miles of road per square mile or greater. Reference Map 4.17-1 for a display of road densities in Region 4 and of the areas where gas development on federal mineral estate has increased road density.

Avoidance is greatest along more heavily traveled secondary or dirt roads (Rost and Bailey 1979, Perry and Overly 1976). Other factors affecting road avoidance by big game include slower traffic speed, vehicles that stop, and traffic with associated out-of-vehicle activity by humans and/or dogs. All of these factors are known to increase the distance big game move away and are typical of traffic associated with gas field activity.

Also associated with displacement is the alteration of migration and natural distribution patterns, resulting in increased or concentrated use of other habitat areas. This is a problem in areas of low quality winter range at, or near, carrying capacity. It results in overutilization, habitat degradation and increased game damage claims from private landowners. This has been an issue in GMU 42 for several years.

Another important effect of human activity on big game involves additional energy expended through alarm and subsequent avoidance movements. This is particularly critical during periods when energy demand is elevated environmentally (cold/homothermy, snow/ locomotion and forage access) or physiologically (late gestation and lactation). Unnecessary energy expenditures divert energy stored for extended winter nutrition, successful gestation and lactation. This ultimately affects production, survival and recruitment.

Indirect impacts due to displacement would occur during all phases. Wintering mule deer, elk and mountain lion would likely be the most affected since most of the development has and will continue to occur on big game winter range. Drilling typically occurs on a year round basis. The effects from displacement and avoidance movements of big game are greatest on crucial and high value habitat during this critical season.

Under standard lease terms, BLM can restrict gas development for up to 60 days. This restriction is most typically applied in designated crucial mule deer and elk winter range during severe winters (an average of two out of ten winters). There is also some voluntary compliance by operators with a requested five month winter restriction for drilling on BLM-managed minerals. However, this appears to simply shift the activity to private lands, so little benefit to big game may be realized. BLM must consider the effectiveness of imposting a five month winter restriction if it only results in such a shift to private lands and will work with the operator to coordinate timing of activities. Refer to Chapter 2, Section 2.7 for more information on the GAP.

BLM can control the access on roads associated with development of BLM-managed minerals (about 20-25 percent of total development). Some roads constructed on private lands may be gated and closed to the public, thus limiting most traffic on those privately owned roads to the landowner, guests and permitted uses; however, there is still trespass use by individuals who ignore the signs, skirt the gate or cut the fence and use the area without permission from the land owner.

In some instances, access created for gas development can be advantageous in that it permits access to BLM lands that is necessary for achieving big game harvest objectives, project work and fire control.

Indirect Impact Assessment Methodology. The analysis of displacement in this document involved mapping of displacement zones and assessment of the effects on habitat value based on potential levels of human activity. For mule deer, a one-eighth mile displacement from gas pads and roads was used; one-half mile was used for elk. (See Appendix G of the Draft SEIS for a discussion of the rationale for the displacement distances.) These represent average displacement distances. Animals may occur within these displacement zones where levels of human activity are low or when sufficient cover is present. Similarly, animals would be displaced at distances greater than the displacement zone where levels of human activity are high and cover is not available. Use of habitat is expected to increase gradually as distance from roads and facilities increases. The zone of reduced use along the roads partially fragments the habitat but would not present a complete barrier to movement of most wildlife species.

To estimate the extent of the displacement effect on mule deer and elk winter range by all activities in Region 4 (I-70, subdivisions, towns, etc.), all roads in BLM's Geographic Information System (GIS) database were buffered, one-eighth mile on either side of the road for deer and one-half mile for elk. The resulting buffer represents the area in Region 4 in which roads may influence the use of wildlife habitat. The overlap of these buffer zones with each species' winter range is an estimate of the extent to which their crucial habitat has been affected by all activities in Region 4. Since BLM's road database is not comprehensive, the result may underestimate the impact somewhat. A similar technique was used to estimate the effect of roads on riparian areas.

By this method, the total potential displacement effect of all roads on mule deer winter range was estimated at 151,590 acres. This amounts to 55 percent of the mule deer winter range in Region 4. The portion of this impact attributable to gas development on BLM-administered mineral estate was estimated by comparing the length of roads constructed for BLM wells, 56.8 miles, to the total distance of all roads in the database, 2,098 miles; BLM gas development roads make up about 2.7 percent of the total. Since all BLM wells have been drilled in mule deer winter range, 2.7 percent of the total impacted mule deer winter range is estimated to be attributable to BLM gas development. This amounts to 4,093 acres, averaging 26 acres per BLM well. This average is assumed to apply to future BLM development.

The same method, but using a one-half mile buffer on the roads instead of one-eighth mile, estimates that 245,357 acres of elk winter range, 94 percent of the total, has been influenced by all activities. Since only 50 percent of the BLM development has occurred in elk winter range, the potential displacement effect of BLM development, 6,624 acres (2.7 percent of the total affected acreage), is only half that, 3,312 acres, averaging about 21 acres per BLM well. This average is assumed to apply to future BLM development.

The cumulative indirect affect of all oil and gas roads was estimated by assuming that all newly constructed oil and gas roads averaged the same length as new BLM oil and gas roads, .38 of a mile. If so, then the 700 wells drilled in Region 4 to date, produced 265 miles of new roads, 12.6 percent of the total roads in the Region. This then is the estimate of the portion of all oil and gas roads that could contribute to the displacement effect on mule deer and elk. It is adjusted in each case by the percentage of wells drilled in each species' winter range, 88 percent for mule deer and 53 percent for elk. Thus, the impact of all oil and gas roads on mule deer winter range is estimated at 16,808 acres (151,590 acres times 12.6 percent times the 88 percent of all wells that were located in mule deer winter range), averaging 24 acres per well. This average is assumed for future cumulative impacts on mule deer winter range.

For elk, a similar process yields an estimated 16,385 acres (245,357 times 12.6 percent times 53 percent) or 23 acres per well, which is assumed for future cumulative indirect impacts on elk winter range.

Raptors

A comprehensive list of raptors nesting in Region 4 is listed in Appendix G of the Draft

SEIS. Although limited inventory has been done, the available information is stored in a GIS database associated with WRIS, developed through an interagency effort.

Direct Impacts. Direct impacts would include destruction of active raptor nests, collision with vehicles, and electrocution from power lines. The destruction of active nests is most likely to occur during the construction phase; however, collisions and electrocutions could occur during all phases. The increased road network would provide more access and illegal shooting could cause some losses of raptors.

Indirect Impact. Indirect impacts include destruction of inactive nests, disturbance and stress associated with human activity in the vicinity of a raptor nest resulting in disruption of the nesting cycle, leading to nest abandonment or mortality of young. This can occur during all phases; however is most likely to occur during the *construction phase* or "workover" period of the *operational phase.*

Raptors that are compelled to abandon their nests may be forced to select other nest sites in areas with lower prey bases which may not be capable of supporting nesting pairs of raptors. Some suitable habitat may be removed from use due to excessive noise associated with permanent facilities such as compressor stations.

The raptor prey base would be reduced by construction activities through displacement or loss of habitat (prey base nests and dens, food sources, etc.) and by vehicle collisions.

The *abandonment phase* could impact raptors that started nesting after the construction phase through the short term disturbance associated with reclamation. In the long term, abandonment would have positive effects as a result of reduced human activity and the return of the disturbed area to a vegetated state.

Upland Game Birds

Turkey, chukar, blue grouse, and sage grouse may experience increased mortality during construction and operation from increased vehicle traffic; however, because of their high reproductive rates, this is unlikely to have any substantial effect on populations in Region 4. All of these species are mobile and unlikely to be killed or injured by other construction activity. Losses of habitat value and populations are assumed to be proportional to the area directly disturbed within the vegetation types representing their general habitat.

Direct impacts on preferred habitat may have a detrimental impact on turkey production areas which are typically associated with riparian zones and the immediately adjacent mountain shrub communities. Chukar habitat may in fact be improved if there is an increase in cheatgrass associated with disturbance. Sage grouse and blue grouse habitat generally does not fall within the development area and is unlikely to be impacted to any degree. In other portions of the resource area, gas development could negatively impact sage grouse leks, nesting habitat and winter range.

Waterfowl and Shorebirds

Important waterfowl and shorebird nesting habitat in Region 4 is generally associated with the Colorado River, gravel pits in the vicinity of the river, Fravert Reservoir and other lakes and reservoirs located mostly on USFS-administered lands. Other areas of importance in the GSRA include King Mountain Reservoir and the Colorado, Roaring Fork and Eagle Rivers. Any activity within or near the riparian zone of these areas during the nesting season could have a detrimental impact on those nesting species.

Predators and Furbearers

Riparian dependent species such as beaver, mink and muskrat are unlikely to be impacted to any great degree if riparian zones and buffer areas immediately adjacent are protected. Predator species such as coyote, fox, bobcat, etc., will be impacted to the degree that their food base is impacted. In highly developed areas, small mammal and bird populations can be expected to decline and thus predators will be forced to move. None of these species is expected to be seriously impacted because of the size of their range and/or the habitat used.

Small Game and Non-game Species

Small prairie dog towns are located in Region 4, west of Una and near the Roan Cliffs. If development occurs within the boundaries of these towns, it could cause a reduction in the prairie dog populations. Disturbance during the construction phase could directly disturb or destroy most prairie dog mounds within these towns. There would likely be increased direct mortality from construction activities, increased numbers of vehicles, and from recreational shooting. This could have a substantial long-term adverse effect on prairie dog populations.

Impacts on non-game birds resulting from the gas development consist of direct mortality from increased human activity and traffic. Indirect impacts consist of displacement from nesting habitat, an increase in cowbirds and other corvids in response to fragmentation and habitat loss. Short-term direct loss of individuals and nest sites can occur in all habitat types during construction activities in the breeding season. Long-term loss of habitat and displacement of birds from breeding habitat also occurs in areas with wells, roads and facilities and high human activity. Although areas of short-term impacts have been revegetated to some degree, their value for songbirds would be reduced for 10-15 years until shrubs are re-established and approximate their original size. Those species associated with some semi-desert scrub, juniper and mixed mountain shrub communities would be most affected as most of the development has occurred in these habitats.

The many other small and non-game species, including desert and mountain cottontail, white tailed jackrabbit, and a variety of squirrels, mice, voles, reptiles and amphibians are relatively common throughout Region 4. Ground disturbing activities such as road and wellpad construction displace, kill or injure small mammals, reptiles and amphibians in the construction zone and more roads and traffic cause increased mortality during both the construction and the operational phases. Areas occupied by above-ground facilities mostly become non-habitat for the life of the project, while areas affected short-term during construction of pipelines and transmission lines may have a reduced carrying capacity for several years until vegetation re-establishes. These small mammals and reptiles are in all of the vegetation types, while amphibians are most likely found in riparian and agricultural areas and in the vicinity of streams and springs. To date, less than one percent of the general small mammal, reptile and amphibian habitat on BLM- managed minerals has been destroyed or altered during construction and operation.

Due to the density of road development occurring within the area of most intense development, death from collisions with motor vehicles and recreational shooting may be greater than that resulting from loss of habitat. The greatest impact would be to those species associated with the semi-desert scrub, juniper and mixed mountain shrub communities as most development will likely occur in these habitats. Important reptile and amphibian habitat (dens, concentration areas and wetland, seeps and riparian areas) can be identified through survey and avoided or impacts mitigated. Animals displaced due to physical habitat loss would be subject to a greatly increased chance of predation.

4.5.3 Impacts to Date

4.5.3.1 BLM Impacts to Date

Most wildlife species have been affected to some degree by the loss of habitat, both directly and indirectly. However, with current available information, only impacts to mule deer and elk are readily quantifiable. All of the wells on

BLM-managed surface and subsurface minerals are in mule deer winter range while about 50 percent are in elk winter range.

The disturbance on BLM-managed minerals has averaged 1.9 acres per wellpad and 1.5 acres of road, pipeline and transmission line, a total of 3.4 acres per well. About half of this loss is short-term, up to ten years, and the rest is long-term or permanent. To date, 160 wells, resulting in 544 acres of disturbance (Table 4.5-1), have been drilled on BLM-administered leases. Thirty of these wells are located in the NOSR Production Area. Since all of these wells have been located in mule deer winter range, the direct loss of mule deer, and other species' habitat due to BLM-authorized activities has been 544 acres, a small part of the total mule deer winter range in the area of concentrated development, 147,466 acres. Loss of deer habitat in the NOSR Production Area was 102 acres. The development to date on elk winter range, 81 wells, directly impacted 275 acres. None of the development in the NOSR Production Area was in elk winter range.

Table 4.5-1 Summary of Impacts on Deer and Elk Winter Range, Region 4 **

Impact	Impacts to Date		Future Impacts				
	BLM	Cumulative	Current Management	Maximum Protection	Proposed Action	Preferred Alternative	Cumulative
Total Wells	160	700	300	280	290	290	1,200
NOSR Wells*	30		70	55	65	65	
Disturbance (Acres)	544	2,380	1,020	952	986	986	4,080
NOSR Disturbance*	102		238	187	221	221	
Deer Winter Range							
Direct Impact (Acres)	544	2,094	6,020	952	986	986	3,590
NOSR Direct Impact*	102		238	187	221	221	
Indirect Impact (Acres)	4,093	16,808	7,800	7,280	7,540	7,540	28,200
NOSR Indirect Impact*	1,536		1,820	1,450	1,690	1,690	
Elk Winter Range							
Direct Impact (Acres)	275	1251	510	476	493	493	2,162
Indirect Impact (Acres)	3,312	16,385	6,300	45,880	6,090	6,090	4,628

* Numbers for the NOSR Production Area are part of the BLM total.
** The indirect effect on winter range is increasingly overstated over time because the buffers will tend to overlap each other.

As described earlier, this analysis uses displacement zones created by roads to express indirect effects on deer and elk. Other species are also indirectly affected by this development to varying degrees. The indirect effects have been quantified for mule deer by buffering the pads and associated roads to represent a displacement zone where habitat effectiveness is reduced in proportion to the density of the roads. For mule deer, the acreage indirectly affected due to BLM-authorized gas development is 4,093 acres. This represents about three percent of the mule deer winter range in the area of most intense development. Of the elk winter range in the same area, an estimated 3,312 acres, about 2.5 percent, have had a displacement influence as a result of developments on BLM-managed surface and mineral estate.

4.5.3.2 Cumulative Impacts to Date

Of the 700 wells drilled in Region 4 since oil and gas development activity began, an estimated 616 wells have been drilled in mule deer winter range, resulting in approximately 2,094 acres of disturbance and long-term habitat loss. This amounts to less than one percent of total mule deer winter range. An estimated 368 wells were drilled on elk winter range, resulting in 1,251 acres (0.5 percent) of disturbance and long-term habitat loss.

The total displacement effect on mule deer winter range from *all* sources of development was calculated at 151,590 acres, about 55 percent of the mule deer winter range in Region 4. The share of this displacement effect caused by all oil and gas roads is an estimated 16,808 acres (4,093 acres on BLM-managed minerals), representing about eleven percent of mule deer winter range in the area of concentrated development. The effect of displacement brought on from oil and gas development may actually be greater than these numbers indicate because so much of the development is concentrated in mule deer *severe* winter range.

Of the total elk winter range in Region 4, 261,789 acres, almost all of it, 94 percent, came under the displacement effect of roads, using a one-half mile buffer. The amount of this displacement effect caused by all oil and gas roads is an estimated 16,385 acres (3,312 acres on BLM-managed minerals), representing about fifteen percent of elk winter range in the most intensely developed area.

Another indicator of displacement effects on winter range, and wildlife habitat in general, is road density. Road densities exceed five miles per square mile along the I-70 corridor from New Castle to Parachute Creek and up Parachute Creek approximately five miles. Most of the road development just north of the Colorado River is directly associated with natural gas development. Road densities of three to five miles per square mile are common throughout much of the rest of the area of concentrated impact (Map 4.17-1). As described earlier, the degree of the impact on the habitat and its ability to support deer and elk is directly related to road density. As road densities approach 4.5 miles or more per square mile, the reduction in effectiveness can reach 50 percent.

Other activities have also affected wildlife in Region 4. The construction of I-70 and its associated big-game-proof fence and the adjacent railroad have altered and fragmented habitat in the Colorado River valley. Migration corridors between summer and winter ranges were effectively cut. Population growth has accelerated in the area. Approximately 10,400 acres of subdivisions had been approved in Region 4 by 1997. Subdivision development often occurs in winter range, brings about invasion of noxious weeds and increased traffic, with its associated disturbance and displacement effect.

CDOW conducted a separate analysis of impacts from drilling activity in three key areas of severe winter range for mule deer and provided that information to BLM during the comment period. It is summarized here. Severe winter range is more limited than winter range by CDOW definitions. Severe winter range (SWR) is defined as "that part of the range of a species where 90 percent of the individuals are located when the annual snowpack is at its maximum and/or temperatures are at a minimum in the two worst winters out of ten.. The analysis provided by CDOW did not include acreage from roads, subdivisions, towns or other disturbances. The analysis reflects the one-eighth mile buffer used by BLM for indirect impacts around a well in severe winter range. The analysis area was divided into three segments. CDOW calculated that 16.7 percent of the SWR north of the Colorado River between Rifle and Parachute (36,414 acres) falls within one-eighth mile of existing wells. South of the Colorado River between Rifle and Parachute (19,077 acres), 12.4 percent is within the same distance. In Divide Creek (43, 918 acres), 6.7 percent of the

SWR is within one-eighth miles of existing wells. Splitting the area north of the Colorado River into two sections at Rulison, CDOW indicates that eleven percent of the SWR acreage (17, 069 acres) east of Rulison is within the one-eighth mile buffer; to the west, 21.8 percent is within the one-eighth mile of an existing well. CDOW concludes that SWR in the Parachute are is suffering greater loss of winter range that elsewhere.

CDOW conducted a separate analysis of impacts from drilling activity in three key acres of severe winter range for mule deer and provided that information to BLM during the comment period. It is summarized here. Severe winter range is more limited than winter range by CDOW definitions. Severe winter range (SWR) is defined as "that part of the range of a species where 90 percent of the individuals are located when the annual snowpack is at its maximum and/or temperatures are at a minimum in the two worst winters out of ten."

The analysis provided by CDOW did not include acreage from roads, subdivisions, towns or other disturbances. The analysis reflects the one-eighth mile buffer used by BLM for indirect impacts around a well in severe winter range. The analysis area was divided into three segments. CDOW calculated that 16.7 percent of the SWR north of the Colorado River between Rifle and Parachute (36,414 acres) falls within one-eighth mile of existing wells. South of the Colorado River between Rifle and Parachute (19, 077 acres), 12.4 percent is within the same distance. In Divide Creek (43,918 acres), 6.7 percent of the SWR is within one-eighth mile of existing wells. Splitting the area north of the Colorado River into two sections at Rulison, CDOW indicates that eleven percent of the SWR acreage (17, 069 acres) east of Rulison is within the one-eighth mile buffer; to the west, 21.8 percent is within the one-eighth mile of an existing well. CDOW concludes that SWR in the Parachute area is undergoing greater impact than elsewhere in Region 4.

4.5.4 Future Impacts

4.5.4.1 Continuation of Current Management Alternative

The stipulations that make up the Continuation of Current Management Alternative are described in detail in Appendix A. Those that affect wildlife in this alternative are:

- A Controlled Surface Use stipulation (CSU) which allows a relocation of more than 200 meters, so that riparian vegetation, perennial water impoundments and springs can be avoided;
- A No Surface Occupancy (NSO) stipulation to protect state wildlife areas and fish hatcheries (none in the NOSR Production Area);
- Various NSOs to protect raptor nests, bald eagle roosts and nests, peregrine falcon nests, Mexican spotted owl roosts and nests, waterfowl production areas, rookeries and leks;
- Timing Limitations (TL) on big game crucial winter habitat and birthing areas, sage grouse crucial winter habitat, most raptor nesting and fledging areas (varying dates and buffer zones; there are no sage grouse in the NOSR Production Area); - A Lease Notice (LN) that sensitive plant or animal populations may require inventory prior to approval of operations and sage grouse nesting habitat.

These stipulations would provide a basic level of protection for these species and their habitats in the NOSR Production Area, where the stipulations would attach to the new leases in that area and would thus be legally binding. They would not provide sufficient protection for the limited riparian habitat in the NOSR Production Area or for the high value wildlife areas there.

Since most of the federal mineral estate in the remainder of Region 4, outside the NOSR Production Area, had already been leased prior to the COGEIS, these stipulation would legally apply in only a limited number of situations.

They would serve, however, as indicators of the direction in which BLM sought to manage oil and gas development so as to minimize the adverse impacts on wildlife. As such they would guide the application of Conditions of Approval (COAs) and efforts to pursue voluntary mitigation. The most important wildlife protections to be pursued through voluntary agreements and COAs include timing limitations and protection of riparian areas and special status species habitat, of which only the timing limitations are well defined in this alternative.

Statutory authority for oil and gas management would still be substantial, however. The standard lease terms call for "modification to siting or design of facilities, timing of operations, and specification of interim and final reclamation measures," limited by a 200 meter maximum on the relocation of the proposed site and a 60 day maximum on delay of the project timetable. Additionally, the Endangered Species Act and BLM policy protect listed, proposed, and to a lesser extent, candidate and sensitive species; and the Migratory Bird Treaty Act protects raptors.

Direct and indirect impacts on big game habitat would be based on the number of wells drilled and the consequent disturbance. An additional 300 wells are anticipated on BLM surface and subsurface mineral estate in Region 4 over the next 20 years. This new development would occur through increased well density in currently developed areas and expansion into new undeveloped areas, generally in the area of concentrated development. The surface disturbance and equivalent direct impact on mule deer would be approximately 1,020 acres, assuming an average disturbance of 3.4 acres per well. An estimated 238 acres of the mule deer winter range disturbance would occur in the NOSR Production Area. Perhaps eighteen wells might be expected outside Region 4, with a resultant disturbance of 60 or more acres.

Direct and indirect acreage impacts on deer and elk habitat are shown in Table 4.5-1. In this alternative, it is projected that 1,020 acres of mule deer winter range would be directly disturbed by gas development under BLM-authorization. The indirect impact of these wells and associated roads affects a displacement zone of 7,800 acres. This is about four percent of the mule deer winter range in the development area. This area would become less effective as habitat for mule deer in proportion to the density of the road network. As densities increase with the infilling of established fields, the effectiveness of the habitat to support mule deer decreases.

Elk winter range would also be impacted both directly and indirectly by BLM-authorized gas development. Fewer of the locations would be on elk winter range and the direct disturbance in this alternative is projected to be 510 acres. The indirect impact, utilizing a one-half mile buffer on pads and associated roads in elk winter range is projected to be 6,300 acres (about four percent of the elk winter range in the area of concentrated development).

4.5.4.2 Maximum Protection Alternative

The difference between the Maximum Protection Alternative and the Continuation of Current Management Alternative lies in the stipulations and other mitigation called for. Appendix B contains a complete description of the mitigation measures in the Maximum Protection Alternative. Those that pertain to wildlife include:

- all of the TLs included in the Continuation of Current Management Alternative plus a TL for sage grouse habitat that is addressed in an LN under current management;
- an NSO from the vegetation out 500 feet to protect riparian and wetland areas and the wildlife habitat therein;
- an NSO with no exceptions to protect fourteen wildlife seclusion areas within Region 4;

- an NSO extending 1/4 mile from the high water mark of the King Mountain reservoirs to protect waterfowl areas;
- an NSO on habitat of federal and state threatened and endangered, and federal proposed or candidate species, and BLM sensitive species;
- a CSU for perennial water impoundments and springs (since riparian areas are now covered by a NSO);
- a series of COAs aimed at restricting activities that might adversely affect wildlife.

These stipulations would provide a high degree of protection for the species and their habitats in the NOSR Production Area, where the stipulations would attach to the new leases in that area and would thus be legally binding. The restrictions would completely protect the limited riparian habitat and the two wildlife seclusion areas in the NOSR Production Area in that gas drilling would be prohibited or severely constrained. Important nesting and roost areas would be fully protected and activities in big game winter range and other seasonal habitat would be protected.

Since most of the federal mineral estate in the remainder of Region 4, outside the NOSR Production Area, has already been leased, the stipulations in this alternative would be legally binding in only a limited number of situations. They would serve, however, as indicators of the direction in which BLM sought to manage oil and gas development so as to minimize the adverse impacts on wildlife. As such they would guide the application of Conditions of Approval (COAs) and efforts to pursue voluntary mitigation. The most important wildlife protections to be pursued through voluntary agreements and COAs include timing limitations and protection of the high value habitat areas, including the seclusion areas, riparian areas and special status species habitat, all of which are clearly defined in this alternative.

Statutory authority for oil and gas management would still be substantial, however. The standard lease terms call for "modification to siting or design of facilities, timing of operations, and specification of interim and final reclamation measures," limited by a 200 meter maximum on the relocation of the proposed site and a 60 day maximum on delay of the project timetable. Additionally, the Endangered Species Act and BLM policy protect listed, proposed, and to a lesser extent, candidate and sensitive species; and the Migratory Bird Treaty Act protects raptors. The lease notices have been added indicate that BLM will use its statutory authority to require operators to work with the BLM and CDOW to develop measures to reduce impacts of their operations on wildlife. These can include habitat improvement projects, closing roads, use of telemetry, etc. Operators would also be encouraged to work with CDOW to establish operating procedures for their employees and contractors. These would help inform them of ways to minimize the effect their presence has on wildlife.

Direct and indirect impacts on big game habitat would be based on the number of wells drilled and the consequent disturbance. Under this alternative, very restrictive resource protection measures would tend to reduce slightly the number of wells from the 300 in the RFD to perhaps 280, of which 55 might be in the NOSR Production Area. The new wells would be drilled in areas of already high density in currently developed areas and would expand, to some extent, into undeveloped areas, but still in the general area of concentrated development. The surface disturbance and equivalent direct impact on mule deer would be approximately 952 acres, assuming an average disturbance of 3.4 acres per well. Perhaps eighteen wells might be expected outside Region 4, with a resultant disturbance of 60 or more acres.

Direct and indirect acreage impacts on deer and elk habitat are shown in Table 4.5-1. In this alternative, it is projected that 952 acres of mule deer winter range would be directly disturbed by gas development under BLM-authorization. About 187 acres of the affected mule deer winter range would be in the NOSR Production Area. The indirect impact of these wells and associated roads affects a displacement zone of 7,280 acres. This is about four percent of the mule deer winter range in the development area. This area would become less effective as habitat for mule deer in proportion to the density of the road network. As densities increase with the infilling of established fields, the effectiveness of the habitat to support mule deer decreases.

Elk winter range would also be impacted both directly and indirectly by BLM-authorized gas development. Fewer of the locations would be on elk winter range and the direct disturbance in this alternative is projected to be 476 acres. The indirect impact, utilizing a one-half mile buffer on pads and associated roads in elk winter range is projected to be 5,880 acres (about four percent of the elk winter range in the area of concentrated development).

4.5.4.3 Proposed Action

The difference between the Proposed Action and the other alternatives is the configuration of mitigation measures included in the Proposed Action. Appendix C contains a complete description of those mitigation measures. The measures that concern wildlife include:

- all of the TLs included in the Maximum Protection Alternative plus a TL on waterfowl and shorebird production areas, that includes the King Mountain reservoirs and the Fravert Reservoir Watchable Wildlife;
- an NSO on the riparian vegetation zone and a CSU on the 500 feet of habitat adjacent to the riparian vegetation zone;
- an NSO with no exceptions to protect fourteen wildlife seclusion areas within Region 4 as in the Maximum Protection Alternative;
- a CSU on perennial water impoundments and springs;
- a CSU on the habitat of BLM sensitive plant and animal species (replacing an NSO in the Maximum Protection alternative);
- a LN requiring development of specific measures to reduce impacts of operations on wildlife;
- a LN encouraging operators to develop, in conjunction with the CDOW, a set of operating procedures for employees and contractors working in important wildlife habitats.

These stipulations would provide a high degree of protection for the species and their habitats in the NOSR Production Area, where the stipulations would attach to the new leases in that area and would thus be legally binding. The restrictions would completely protect the limited riparian vegetation and would provide strong protection for the habitat in the adjacent 500 feet. Gas drilling in the two wildlife seclusion areas in the NOSR Production Area would be prohibited. Important nesting and roost areas would be fully protected and activities in big game winter range and other seasonal habitat would be protected.

Since most of the federal mineral estate in the remainder of Region 4, outside the NOSR Production Area, has already been leased, the stipulations in this alternative would be legally binding in only a limited number of situations. They would serve, however, as indicators of the direction in which BLM sought to manage oil and gas development so as to minimize the adverse impacts on wildlife. As such they would guide the application of Conditions of Approval (COAs) and efforts to pursue voluntary mitigation. The most important wildlife protections to be pursued through voluntary agreements and COAs include timing limitations and protection of the high value habitat areas, including the seclusion areas, riparian areas and special status species habitat, all of which are clearly defined in this alternative.

Statutory authority for oil and gas management would still be substantial, however. The standard lease terms call for "modification to siting or design of facilities, timing of operations, and specification of interim and final reclamation measures," limited by a 200 meter maximum on the relocation of the proposed site and a 60 day maximum on delay of the project timetable. Additionally, the Endangered Species Act and BLM policy protect listed, proposed, and to a lesser extent, candidate and sensitive species; and the Migratory Bird Treaty Act protects raptors.

The lease notices indicate that BLM will use its statutory authority to require operators to work with the BLM and CDOW to develop measures to reduce the impacts of their operations on wildlife. These measure might include habitat improvement projects, closing roads, use of telemetry, etc. Operators would also be encouraged to work with CDOW to establish operating procedures for their employees and contractors. These would help inform them of ways to minimize the effect their presence has on wildlife.

Direct and indirect impacts on big game habitat would be based on the number of wells drilled and the consequent disturbance. Under this alternative, restrictive resource protection measures would tend to reduce slightly the number of wells from the 300 in the RFD to perhaps 290, of which 65 might be in the NOSR Production Area. The new wells would be drilled in areas of already high density in currently developed areas and would, to some extent, expand into developed areas, but still in the general area of concentrated development. The surface disturbance and equivalent direct impact on mule deer would be approximately 986 acres, assuming an average disturbance of 3.4 acres per well. Perhaps eighteen wells might be expected outside Region 4, with a resultant disturbance of 60 or more acres.

Direct and indirect acreage impacts on deer and elk habitat are shown in Table 4.5-1. In this alternative, it is projected that 986 acres of mule deer winter range would be directly disturbed by gas development under BLM-authorization (221 acres in the NOSR Production Area). The indirect impact of these wells and associated roads affects a displacement zone of 7,540 acres. This is about four percent of the mule deer winter range in the development area. This area would become less effective as habitat for mule deer in proportion to the density of the road network. As densities increase with the infilling of established fields, the effectiveness of the habitat to support mule deer decreases.

Elk winter range would also be impacted both directly and indirectly by BLM-authorized gas development. Fewer of the locations would be on elk winter range and the direct disturbance in this alternative is projected to be 493 acres. The indirect impact, utilizing a one-half mile buffer on pads and associated roads in elk winter range is projected to be 6,090 acres (about four percent of the elk winter range in the area of concentrated development).

4.5.4.4 Preferred Alternative

The difference between the Preferred Alternative and the other alternatives is the configuration of mitigation measures included in the alternative. Chapter 2 contains a complete description of those mitigation measures. The measures in the Preferred Alternative that concern wildlife are the same as those in the Proposed Action, except that the NSO to protect fourteen wildlife seclusion areas within Region 4 has been changed to permit exceptions. Upon completion of a plan that shows how the operator can protect or mitigate the wildlife seclusion values in the area, the authorized officer could permit drilling in the area.

These mitigation measures in the Preferred Alternative would provide a high degree of protection for the species and their habitats in the NOSR Production Area, where the stipulations would attach to the new leases in that area and would thus be legally binding. The restrictions would completely protect the limited riparian vegetation and would provide strong protection for the habitat in the adjacent 500 feet. Gas drilling in the two wildlife seclusion areas in the NOSR Production Area would be permitted only after completion of a plan to protect the values at stake. Important nesting and roost areas would be fully protected and activities in big game winter range and other seasonal habitat would be protected.

Since most of the federal mineral estate in the remainder of Region 4, outside the NOSR Production Area, has already been leased, the stipulations in this alternative would be legally binding in only a limited number of situations. They would serve, however, as indicators of the direction in which BLM sought to manage oil and gas development so as to minimize the adverse impacts on wildlife. As such they would guide the application of Conditions of. Approval (COAs) and efforts to pursue voluntary mitigation. The most important wildlife protections to be pursued through voluntary agreements and COAs include timing limitations and protection of the high value habitat areas, including the seclusion areas, riparian areas and special status species habitat, all of which are clearly defined in this alternative.

Statutory authority for oil and gas management would still be substantial, however. The standard lease terms call for "modification to siting or design of facilities, timing of operations, and specification of interim and final reclamation measures," limited by a 200 meter maximum on the relocation of the proposed site and a 60 day maximum on delay of the project timetable. Additionally, the Endangered Species Act and BLM policy protect listed, proposed, and to a lesser extent, candidate and sensitive species; and the Migratory Bird Treaty Act protects raptors.

The lease notices indicate that BLM will use its statutory authority to require operators to work with the BLM and CDOW to develop measures to reduce the impacts of their operations on wildlife. These measure might include habitat improvement projects, closing roads, use of telemetry, etc. Operators would also be encouraged to work with CDOW to establish operating procedures for their employees and contractors. These would help inform them of ways to minimize the effect their presence has on wildlife.

Direct and indirect impacts on big game habitat would be based on the number of wells drilled and the consequent disturbance. Under this alternative, restrictive resource protection measures would tend to reduce slightly the number of wells from the 300 in the RFD to perhaps 290, of which 65 might be in the NOSR Production Area. The new wells would be drilled in areas of already high density in currently developed areas and would, to some extent, expand into developed areas, but still in the general area of concentrated development. The surface disturbance and equivalent direct impact on mule deer would be approximately 986 acres, assuming an average disturbance of 3.4 acres per well. Perhaps eighteen wells might be expected outside Region 4, with a resultant disturbance of 60 or more acres.

Direct and indirect acreage impacts on deer and elk habitat are shown in Table 4.5-1. In this alternative, it is projected that 986 acres of mule deer winter range would be directly disturbed by gas development under BLM-authorization (221 acres in the NOSR Production Area). The indirect impact of these wells and associated roads affects a displacement zone of 7,540 acres. This is about four percent of the mule deer winter range in the development area. This area would become less effective as habitat for mule deer in proportion to the density of the road network. As densities increase with the infilling of established fields, the effectiveness of the habitat to support mule deer decreases.

Elk winter range would also be impacted both directly and indirectly by BLM-authorized gas development. Fewer of the locations would be on elk winter range and the direct disturbance in this alternative is projected to be 493 acres. The indirect impact, utilizing a one-half mile buffer on pads and associated roads in elk winter range is projected to be 6,090 acres (about four percent of the elk winter range in the area of concentrated development).

4.5.5 Cumulative Impacts

The cumulative effect on mule deer habitat from the future development of 1,200 wells in Region 4 includes a direct impact on 3,590 additional acres of winter range which would be physically disturbed and an indirect effect on an additional 28,200 acres, about eleven percent of the mule deer winter range in Region 4. When that is added to the acreage impacted by oil and gas development to date, 16,808 acres, a total of 45,008 acres of winter range would have been affected, sixteen percent of the total acreage of winter range in Region 4.

The cumulative effect of all gas development wells on elk winter habitat includes a direct impact of an additional 2,162 acres and an indirect impact of 14,628 acres. This represents approximately 20 percent of the elk winter range in Region 4. When added to the indirect acreage impacted by oil and gas development to date, 16,385 acres, the amount of elk winter range that may be impacted by oil and gas development is about 31,000 acres. Due to the width of the road buffer for elk (one-half mile on either side), the indirect impact acreage is overstated to some degree as each road buffer tends to overlap other road buffers; road densities will continue to increase, further reducing habitat effectiveness.

When all currently mapped roads in Region 4 were buffered and intersected with elk winter range, 94 percent of the winter range (245,357 acres) has been impacted to some degree. Therefore, much of any new road development attributable to oil and gas development in the future would most likely result, not in new areas on displacement impact, but rather in increased road density and increased traffic. This effect would of course bring about a corresponding decrease in habitat effectiveness and therefore reduce its carrying capacity. Elk summer and calving areas south of the Colorado River may become more impacted as the development moves upward in elevation.

Activities other than oil and gas development will also affect wildlife in Region 4 in the coming years. Continued subdivision development, converting agricultural and other lands into residential uses, is expected. This type of development usually occurs in winter range. Population growth also brings with it an increase in recreational activity in the area. The use of Off-Highway-Vehicles (OHVs) brings recreationists into areas previously inaccessible to motor vehicles. This further fragments habitat and reduces habitat effectiveness.

4.6 Special Status Species

This Section supplements the discussion of Special Status Species included in the FEIS, at varius locations in Chapter 4.

4.6.1 Impacts to Date

BLM Impacts to Date: ***Plants***. Typical impacts on the known special status plant populations include: competition from noxious weeds and other invasive plants, trampling and grazing damage, and destruction of plants from human development and activity.

Upon receipt of a Notice of Staking or an Application for Permit to Drill (APD) from the gas leaseholder, BLM determines whether potential habitat for any special status species exists within the area. A botanical inventory is conducted of any potential habitat within the project area. If the inventory discovers any special status plants which may be affected by the project, the plants are either avoided or impacts are mitigated. The intent of mitigation is to reduce impacts on populations of rare plants to a minimum.

Little oil and gas activity in Region 4 has occurred in the proximity of any special status plants. However, in those instances in which special status plants were identified in the vicinity of the activity, mitigation has not always been effective. In one instance, a wellpad was relocated less than ten feet to avoid a population of BLM Sensitive plants. Subsequent visits to the site determined that the new road and pad had become a conduit for livestock travel and the rare plants had been damaged by grazing and trampling. Other pads have been relocated 20-30 feet to avoid portions of a population, but the remainder of the population was destroyed. A DOE proposed well bore was in the midst of a two to three acre population of rare plants. DOE moved the pad slightly to avoid the highest concentration of the plants but did destroy a sizeable number of individuals. DOE also constructed a fence around the pad to minimize off-site impacts to the rare plant population.

In another case, a proposed well location would have destroyed several dozen BLM Sensitive plants. The BLM conducted an on-site visit after the survey revealed the presence of a rare plant. Alternative pad sites would have required greater cut-and-fills and created more impacts to the drainage. The pad was moved slightly to avoid a clump of the rare plants, but another dozen or so were directly impacted by pad construction.

Within Region 4, the isolated impacts to date have not had a substantial negative effect on the entire populations of these rare plants. However, as oil and gas development continues and well density increases, the potential impacts are magnified. A large population of a BLM Sensitive plant has recently been discovered in the Beaver Creek drainage. Most of the gas wells drilled in this watershed to date have not been in occupied habitat. However, numerous wells are being proposed within the occupied habitat, and protection may require substantial changes in pad placement and access road design.

Wildlife. Only limited inventory information exists on bald eagles, peregrine falcon, northern goshawk and the Colorado River fish including humpback chub, bonytail chub, Colorado squawfish, Colorado River cutthroat trout and razorback sucker. Section 7 consultation with the USFWS has been completed on any actions that had a likelihood of affecting known populations of these specie (See Appendix F). No inventories (other than for the northern goshawk) have been completed in Region 4 for the other species included on the Sensitive species list in Chapter 3. A small number of past APDs have had a limited raptor survey completed on them, with no raptors observed; however, these surveys are not completed on a regular basis. Impacts that may have occurred include habitat destruction, habitat disruption during critical periods, indirect loss of habitat and direct mortality.

Cumulative impacts to date: ***Plants***. Some populations of rare plants are experiencing competition from noxious weeds and other invasive plants. These populations are close to roads and other disturbance, so it is likely the disturbance contributed to the establishment of the weeds.

Throughout the GSRA, including Region 4, certain rare plants are most likely being heavily impacted by housing subdivision projects and other commercial development. Threatened or endangered plants which occur on privately owned land are not protected under the Endangered Species Act (ESA), therefore any protection provided is on a voluntary basis. Nor are other special status plants on private lands inventoried or protected, except when the action occurring involves authorization by a federal agency. If impacts on private land continue to increase, then the populations which occur on public land become even more important to the survival of the species.

Wildlife. Sensitive wildlife species are likely being negatively impacted both throughout Region 4 and in the rest of the GSRA as a result of development on private lands; however, again, without inventory information prior to development, this can only be speculated upon. On public lands, major commercially driven actions such as pipelines, power lines, etc. do receive field inventories by approved contractors prior to approval, while BLM driven actions are reviewed in-house, with field surveys conducted as necessary. Appropriate mitigation is developed and implemented, thus reducing or eliminating detrimental impacts.

Threatened or endangered wildlife species which occur on privately owned land are provided some protection under the ESA if knowledge of the species exists and if the action occurring is authorized in some fashion by a federal agency. Development of private and public lands is increasing at a rapid rate, making the protection of the remaining viable habitat for special status species even that more critical in the future, for the survival of viable populations in the GSRA.

4.6.2 Future Impacts

The following analysis is based upon the assumption that adequate pre-development inventories are completed and the information is available prior to authorizing actions that might have a detrimental impact on any special status species. The inventories will be used to develop appropriate mitigation to protect these resources.

Under all alternatives, threatened and endangered species found on both new and existing leases are protected under the Endangered Species Act. Section 7 consultation with the USFWS is required on certain actions having the potential to affect listed threatened and endangered species, or adversely modify or destroy designated critical habitat, and additional mitigation may be identified through this process. If the action is likely to jeopardize a proposed species or cause destruction or adverse modification of proposed critical habitat, further consultation with the USFWS is required which may result in additional mitigation.

Threatened and endangered candidate species and BLM sensitive species are protected by BLM policy, which directs that actions on public lands not contribute to the need to list a species, as long as it does not unduly hinder lease rights granted. Raptors are afforded additional protection by other federal and state laws listed in Chapter 3. On new and existing leases, these protections are implemented under the standard lease terms. On new leases, additional protection may be provided by stipulations attached to the lease.

4.6.2.1 Continuation of Current Management Alternative

The Continuation of Current Management Alternative would implement the stipulations developed in the FEIS on new leases. The protective stipulations include a No Surface Occupancy (NSO) stipulation on habitat areas for listed, proposed and candidate plant species. Nest and roost sites of several listed or BLM sensitive bird species are protected with NSOs of variable radius depending on the species. These NSOs are applied to locations known prior to issuance of the lease. New locations cannot be added to the lease after the lease has been issued. If subsequent inventories locate additional special status plant or animal populations, these populations are protected under the standard lease terms, including the option to increase the protection, if site specific analysis leads to an undue and unnecessary degradation determination. Threatened or endangered species and sensitive raptors enjoy the additional protection discussed above.

The AO may make exceptions to the NSOs after important factors are considered in the impact analysis such as the type and amount of surface disturbance; plant frequency and density; the relocation of disturbances; relative abundance of habitat; the species and location of animals; the active status of nests and the presence of topographic or vegetative screening. Issues affecting listed species may also require consultation with the USFWS and CDOW. On new leases, the NSO stipulation on listed, proposed and candidate species should fully protect those species and habitats identified prior to lease issuance.

Sensitive species and significant natural plant communities would be protected only by the standard lease terms, unless site specific analysis supports a determination of undue and unnecessary degradation. If an undue and unnecessary degradation decision is not made, loss of individuals and populations may occur which might create adverse impacts to the viability of certain populations.

4.6.2.2 Maximum Protection Alternative

Under the Maximum Protection Alternative, NSO protection is extended to include not only federal listed, proposed and candidate plant species, but also federal and state wildlife species and their habitat. BLM sensitive species and their habitat are also included in the NSO. The NSO may be altered after the AO has considered each of the factors mentioned in the Continuation of Current Management Alternative and determines that the impact to the species will be insignificant. Once a lease has been issued, any new locations of listed species or their habitat would still be protected by the ESA. New locations of other special status species would receive the protection provided by the standard lease terms, including the undue/unnecessary degradation consideration, unless additional protection is voluntarily agreed to by the developer.

4.6.2.3 Proposed Action

Listed species, and proposed and candidate species for listing would receive protection similar to that discussed under the Maximum Protection Alternative. The primary difference between the Maximum Protection Alternative and the Proposed Action is that BLM sensitive species are protected by a CSU stipulation rather than an NSO. The CSU may require relocating oil and gas activities by more than 200 meters or other mitigating measures designed to protect the species and its habitat. The CSU provision should be adequate to protect Sensitive species in most cases. However, in some situations where populations are widespread or the habitat needs are extensive, even a move of greater than 200 meters may not be sufficient to protect the entire population of the species, usually plants, and some portion of the population may be removed.

Given compliance with the ESA, federal and state laws and BLM policy, and any additional measures identified by the BLM, significant direct impacts to special status species are not anticipated. Implementation of mitigation measures to prevent or reduce the potential for noxious weed introduction and spread in areas of potential habitat and to reduce the potential for grazing or trampling damage would minimize the potential for negative indirect effects to plant communities. Voluntary implementation of timing limitations and other necessary mitigation developed during the project EA phase could help minimize potential for negative indirect effects on special status species and their habitats.

4.6.2.4 Preferred Alternative

The Preferred Alternative is the same as the Proposed Action and the impacts would be the same.

4.6.3 Cumulative Impacts

The cumulative effect of impacts due to oil and gas drilling on private mineral estate and by other human activities may create sufficient disturbance that some of the special status species may be placed at risk.

4.7 Wild Horses

The Wild Horses portion of the Environmental Consequences section was discussed on pages 4-10 and 4-11 of the FEIS. There are no managed populations of wild horses in the GSRA and they are not discussed in this SEIS.

4.8 Soils

This section supplements and updates the FEIS, Chapter 4, Environmental Consequences, Soils, page 4-11 through 4-13.

Impacts resulting from oil and gas development include removal of vegetation, exposure of the soil, mixing of soil horizons, soil compaction, loss of top soil productivity and increased susceptibility of the soil to wind and water erosion. Wind erosion would be expected to be a minor contributor to soil erosion in Region 4 with the possible exception of dust from vehicle traffic. These direct impacts could result in increased runoff, erosion and off-site sedimentation and subsequently increase the loss of the base natural resource. Additionally, they could create remediation challenges in areas with soils of poor to very poor reclamation potential. Activities that could cause these types of impacts include construction and operation of well sites, access roads, gas pipelines, and ancillary facilities as described in detail in the Draft SEIS, Appendix A. Contamination of soils from drilling and production wastes mixed into soils or spilled on the soil surfaces could cause a long term reduction in site productivity. Some of these impacts can be reduced or avoided through proper design, construction and maintenance and implementation of a variety of mitigation methods.

Refer to Appendix D, Conditions of Approval, and Appendix I of the Draft SEIS, Reclamation, for information concerning standard practices commonly utilized to minimize erosion resulting from oil and gas operations in the GSRA.

4.8.1 Impacts to Date

BLM Impacts to Date. Oil and gas development has produced both short-term and long-term effects to the soil resource. The short-term impacts include removal of vegetation, exposure of the soil, mixing of soil horizons, soil compaction, loss of top soil productivity, increased susceptibility of the soil to water erosion. These have occurred during the construction of pads, roads, pits, and other ancillary facilities. Initially, impacts can be minimized by stockpiling of the top soil and controlling erosion during construction. Following drilling, rehabilitation of disturbed surface begins within days. Much of the original disturbance, including cut-and-fill slopes, that is not needed for operations is reshaped and revegetated. Soil compaction and soil mixing may reduce soil productivity in the short-term on rehabilitated sites following initial construction. Generally, soil erosion is higher on recently rehabilitated sites and decreases over time to lower levels in about three years.

On wells, access roads, and ancillary facilities that are required over the life of the oil and gas production cycle, a long-term commitment of soil resources would occur. Such sites generally remain non-productive and continue to be at risk of erosion and weed infestation. Soil erosion from these facilities is usually minimized by maintenance of roads, construction of waterbars, construction of drainage ditches, and efforts to minimize the size of working surfaces. Long-term compaction of soil on working surfaces would occur. Current GSRA practice calls for use of stockpiled topsoil within a short period of time or it must be protected in a way that will maintain its productivity.

Oil and gas development on the 162,635 acres of public land in Region 4 (including the 12,029 acres in the NOSR Production Area) has resulted in the construction of 160 wellpads and 544 acres of associated surface disturbance (Table 4.8-1). With the average wellpad size of 1.9

surface acres, a total of 304 acres were disturbed for wellpad construction. An additional 1.5 acres of surface disturbance occurred on average for pipelines and roads to access each wellpad, resulting in 240 acres of additional disturbance. After application of reclamation measures in which productivity on portions of the pad area are restored, the long-term commitment of surface/soil for oil and gas production has totaled 304 acres for 160 producing wells, including the 30 wells in the NOSR Production Area. This is an average long-term impact of 1.9 acres per location, 0.4 acres for wellpads and 1.5 acres for roads. The amount of disturbance on highly erosive soil is 37 acres.

The direct impact to soils from oil and gas development on BLM-managed mineral estate in Region 4 has been minimal; an insignificant percentage of the soils in Region 4 have been subject to disturbance. However, construction of wellpads, roads, pipelines, and related facilities may result in a large amount of soil being moved locally in the short-term, potentially resulting in some decreases in water quality in nearby water courses. Any increases in regional soil erosion and resulting sedimentation would not be distinguishable from natural variation in soil erosion rates in the area. This is due primarily to the minimal amounts of disturbance caused by oil and gas development compared with the relatively high natural erosion rates which occur throughout Region 4 and much of the GSRA. An event that occurred in September, 1997 illustrates this point. A high intensity thunderstorm created a debris flow that temporarily closed Garfield County Road 215 approximately three miles north of the town of Parachute. The debris flow came from watersheds with no oil and gas activity.

Table 4.8-1 Surface Disturbance to Date and For All Alternatives, Region 4

	ACRES DISTURBED			ACRES IN USE (LONG-TERM)		
	TOTAL	ROADS	PADS	TOTAL	ROADS	PADS
Disturbance to date on BLM	544	240	304	304	240	64
Average per Well	3.4	1.5	1.9	1.9	1.5	0.4
Cumulative disturbance to date	2,380	1,050	1,330	1,330	1,050	280
Future disturbance on BLM (including NOSR)	BLM/ NOSR	BLM/ NOSR	BLM/ NOSR	BLM/ NOSR	BLM/ NOSR	BLM/ NOSR
Continuation of Current Management Alternative	1,020/ 238	450/ 105	570/ 133	570/ 133	450/ 105	120/ 28
Maximum Protection Alternative	952/ 187	420/ 83	532/ 104	532/ 104	420/ 83	112/ 22
Proposed Action	986/ 222	435/ 98	551/ 124	551/ 124	435/ 98	116/ 26
Preferred Alternative	986/ 222	435/ 98	551/ 124	551/ 124	435/ 98	116/ 26
Cumulative Future Disturbance	4,080	1,800	2,280	2,280	1,800	480

Cumulative Impacts to Date. An estimated 540 wells have been drilled on private land. Assuming the average disturbance on fee wells is the same as for BLM wells, 1.9 acres for the wellpad and 1.5 acres for the road, then 1,836 acres have been disturbed by oil and gas development on private property (2,380 acres for all 700 wells; see Table 4.8-1). Assuming all but an average of 1.9 acres per well disturbance on public and private land have been rehabilitated, the long-term commitment of surface/soil for the oil and gas production on all lands has amounted to 1,330 acres for 700 wells.

The direct impact to soils from oil and gas development on BLM-managed mineral estate in Region 4 has been minimal; an insignificant percentage of the soils in Region 4 have been subject to disturbance. However, construction of wellpads, roads, pipelines, and related facilities may result in a large amount of soil being moved locally in the short-term, potentially resulting in some decreases in water quality in nearby water courses. Any increases in regional soil erosion and resulting sedimentation would not be distinguishable from natural variation in soil erosion rates in the area. This is due primarily to the minimal amounts of disturbance caused by oil and gas development compared with the relatively high natural erosion rates which occur throughout Region 4 and much of the GSRA.

4.8.2 Future Impacts

4.8.2.1 Continuation of Current Management Alternative

Under the Continuation of Current Management Alternative, soils would be protected by a NSO stipulation on critical watershed areas identified in the RMP and by two CSU stipulations, one aimed at maintaining site productivity and controlling erosion in highly erosive soil areas; and the other aimed at maintaining productivity and controlling erosion on sites with over 40 percent slope. These stipulations would attach to new leases in the NOSR Production Area and would define management objectives for development on already existing leases.

If the 300 new wells anticipated to be drilled on BLM-managed mineral estate during the next twenty years average 3.4 acres of site disturbance per well, then an estimated 1,020 acres of associated surface disturbance would result. Seventy of these wells would be drilled in the NOSR Production Area, resulting in 238 acres of associated disturbance. A total of 48 acres of highly erosive soils would be disturbed.

The anticipated short-term and long-term impacts to soils are assumed to be similar to those that have occurred to date, although the magnitude of impact would be greater because of the higher number of anticipated new wells. In the short-term, 1,020 acres of public land would be disturbed. Rehabilitating measures would be implemented shortly after drilling is completed at each site, resulting in the eventual rehabilitation of 450 acres of public land. The long-term commitment of 570 acres would be required for roads and production facilities. This is a worst case analysis where every well would be a producing well and therefore would have long-term impacts.

The total effect with the Continuation of Current Management Alternative on the soils from oil and gas development on public land and on split estate would be minimal; less than one percent of the soils in Region 4 would be subject to disturbance. However, construction of wellpads, roads, pipelines, and related facilities may result in a large amount of soil being moved locally in the short-term, potentially resulting in some decreases in water quality in nearby water courses. Any increases in regional soil erosion and resulting sedimentation would not be distinguishable from natural variation in soil erosion rates in the area. This is due primarily to the minimal amounts of disturbance caused by oil and gas development compared with the relatively high natural erosion rates which occur throughout Region 4 and much of the GSRA.

Over the next 20 years, urbanization of private land is anticipated to continue and would disturb far greater acreage than that anticipated from oil and gas development on BLM-administered mineral estate.

4.8.2.2 Maximum Protection Alternative

The Maximum Protection Alternative would place additional constraints on gas development to protect soil resources. This alternative would impose a NSO stipulation for oil and gas development on highly erosive soils, including areas identified in the RMP as Erosion Hazard Areas. Exceptions to the NSO requirement would be allowed by approval of the AO for site development plans that: a) would maintain the soil productivity of the site, b) would protect off-site areas by preventing accelerated soil erosion (such as land sliding, piping, mass wasting) from occurring, and c) would protect water quality and quantity. Another NSO would prohibit activity on all slopes over 35 percent to protect soils and watersheds. Additionally, a Site Disturbance and Stability NSO, with exceptions, on slopes greater than 25 percent would ensure that sites on steep slopes are managed for maximum reclamation potential.

The Maximum Protection Alternative would protect highly erosive soils and soils on very steep slopes with NSOs throughout the resource area. Since 95 percent of the public mineral estate in Region 4, outside of the NOSR Production Area, is already leased, implementation of the soil resource stipulations in Region 4 might be limited. Compliance with stipulated mitigation would be voluntary or would be based on COAs that do not restrain lease rights. Only one of the RMP-designated Erosion Hazard Areas is in Region 4, the Divide Creek/Center Mountain Erosion Hazard Area. This Erosion Hazard Area was leased prior to 1984 and the wells that have been developed have not demonstrated soil erosion problems because of effective mitigation.

The anticipated short-term and long-term impacts to soils under the Maximum Protection Alternative would be similar to those described in the impacts to date section, although the magnitude of these impacts would be slightly less than the Continuation of Current Management Alternative. A projected 280 wells would be drilled, resulting in impacts on an estimated 952 acres of public land. Rehabilitating measures would be implemented shortly after drilling is completed at each site on approximately 420 acres of public land. The long-term commitment of 532 acres would be required for roads and production facilities. On public land, less then 35 acres of highly erosive soils would be disturbed.

The Maximum Protection Alternative would likely result in fewer wells and wellpad locations in the NOSR Production Area because of other environmental constraints, including protection of visual resources, protection of wildlife values, and protection of special status plant and animal species. An estimated 55 wells would be developed. The wellpads, roads, pipelines, and facilities would result in 187 acres of new disturbance in the NOSR Production Area.

4.8.2.3 Proposed Action

The Proposed Action would allow oil and gas development in the GSRA with a number of environmental protection constraints and mitigating measures. Stipulations that are specific to soil concerns in the Proposed Action are a CSU stipulation on highly erosive soils and a NSO stipulation on slopes over 35 percent. The CSU on highly erosive soils would allow BLM to require special design, construction, and implementation measures, including relocation of operations beyond 200 meters in identified areas of highly erosive soils. Areas identified in the RMP as Erosion Hazard Areas are included in this stipulation.

The NSO on steep slopes over 35 percent would allow the AO to refuse locations in areas where soil erosion problems and/or remediation would be too great. Unlike the Maximum Protection Alternative, the AO may make exceptions to the NSO for short stretches of steep road to access a location. Additionally, a Site Disturbance and Stability CSU on slopes greater than 25 percent would ensure that sites on steep slopes are managed for maximum reclamation potential.

The anticipated short-term and long-term impacts to soils would be similar to the impacts described in the impacts to date section.

However, the magnitude of these impacts would be slightly less than the Continuation of Current Management Alternative. A projected 290 wells would be drilled, resulting in an estimated 986 acres of new disturbance on public land. Rehabilitating measures would be implemented within days of disturbance at each site, eventually leading to reclamation on a projected 435 acres of public land. The long-term commitment of 551 acres of public land would occur for production facilities and roads. Less then 36 acres of highly erosive soils would be disturbed.

In the NOSR Production Area, the number of wells would increase to 65 wells from the 55 in the Maximum Protection Alternative. The 65 wellpads, roads, pipelines, and associated facilities would result in 222 acres of new disturbance over the next 20 years.

4.8.2.4 Preferred Alternative

Measures included in the Preferred Alternative to minimize impacts to erosive soils and steep slopes are similar to those in the Proposed Action Alternative. The NSO for steep slopes was raised to 50 percent, though the CSU for Erosive Soils and Slopes Greater than 30 percent establishes conditions to provide adequate protection to soils on the steeper slopes. Though some wells on steeper slopes are more likely to be constructed under the Preferred Alternative compared to the Proposed Action Alternative, no impacts to the total numbers of wells are expected and overall impacts to soils are expected to be similar to those described for the Proposed Action Alternative.

4.8.3 Cumulative Future Impacts

It is anticipated that a total of 1,200 new wells would be drilled in the next 20 years in Region 4, concentrated primarily in the areas with current development. An average of 60 new wells would be drilled each year, fifteen on public land. The proportion of future wells by land status, the amount of soil disturbance per well, and the proportion of multi-hole wellpads is assumed to be proportionately the same in the future as is presently occurring. Consequently, oil and gas development would continue to have the same types of impacts to soils in the future as is presently occurring.

The new wells would impact an estimated 4,080 acres over the next 20 years. A projected 900 wells would be drilled on private property, and 300 wells on public land. Approximately 1,020 acres of public land and 3,060 acres of private land would be disturbed. Rehabilitating measures would be implemented within days of disturbance on a projected 450 acres of public land and on 1,350 acres of private land if reclamation efforts similar to BLM's were pursued. A long-term commitment of 570 acres of public land and 1,710 long-term acres of private land would occur for production facilities. This is a worst case analysis where every well would be a producing well and therefore would have long-term impacts.

The cumulative effect on the soils from oil and gas development would be minimal; less than one percent of the soils in Region 4 would be subject to disturbance. However, construction of wellpads, roads, pipelines, and related facilities may result in a large amount of soil being moved locally in the short-term, potentially resulting in some decreases in water quality in nearby water courses. Any increases in regional soil erosion and resulting sedimentation would not be distinguishable from natural variation in soil erosion rates in the area. This is due primarily to the minimal amounts of disturbance caused by oil and gas development compared with the relatively high natural erosion rates which occur throughout Region 4 and much of the GSRA. Over the next 20 years, urbanization of private land is anticipated to continue and would disturb far greater acreage than that anticipated from oil and gas development on BLM-administered mineral estate.

4.9 Water

This Section supplements the discussion of Water in the FEIS, Chapter 4, page 4-13 and 4-14.

4.9.1 Surface Water

Potential impacts that could occur due to oil and gas drilling include increased surface water runoff and off-site sedimentation brought about by soil disturbance; increased salt loading and water quality impairment of surface waters; channel morphology changes due to road and pipeline crossings; and contamination of surface waters by produced water. The magnitude of these impacts to water resources would depend on the proximity of the disturbance to the drainage channel, slope aspect and gradient, degree and area of soil disturbance, soil character, duration and time within which construction activity would occur, and the timely implementation and success or failure of mitigation measures. Impacts would likely be greatest shortly after the start of construction activities and would likely decrease in time due to natural stabilization, and reclamation efforts. Construction activities would occur over a relatively short period; therefore, the majority of the disturbance would be intense but short lived. Petroleum products and other chemicals could be accidentally spilled resulting in surface and groundwater contamination. Similarly, reserve and evaporation pits could leak and degrade surface and ground water quality. Authorization of the proposed project would require full compliance with BLM directives and stipulations that relate to surface and ground water protection, Executive Order 11990 (floodplain protection), and the Federal Clean Water Act (CWA) in regard to protection of water quality and compliance with Section 404.

4.9.1.1 Impacts to Date

Oil and gas activities have resulted in minimal adverse impacts to water resources. Some of the impacts affecting soils as described in Section 4.8 could also affect surface water. Table 4.8-1 summarizes the amount of surface disturbance for all activities to date and for future alternatives. These impacts could increase runoff, erosion and off-site sedimentation which could cause channel instability and degradation of surface water quality.

The short-term impacts to surface water are primarily an increase in sediment and, potentially, salinity that occurs while the surface is disturbed. Surface water is most susceptible to sediment and salt yield while facilities are under construction. Within days following completion of drilling, measures to mitigate the disturbed site are implemented. Generally, sediment and salt yield are slightly higher on recently rehabilitated sites and decrease over time to a negligible level in about three years.

Long-term impacts from oil and gas production occur on wellpads, access roads and ancillary facilities that are required during the oil and gas production cycle. Soil-compacted sites on driving surfaces and sites that are not revegetated contribute greater amounts of runoff then undisturbed and rehabilitated sites. Increases in peak flow can cause increases in channel and bank erosion. Runoff from exposed subsurface soil often contains higher than normal amounts of salts and other pollutants. Mitigating measures such as construction of waterbars, road maintenance, drainage ditches, and efforts to minimized working surfaces would decrease negative impacts. Long-term increases in runoff, channel bank erosion, sediment and salt yield are minimal to date from oil and gas development in Region 4.

An evaluation of surface disturbance gives an indirect indication of the level of impact oil and gas activity has had on water quality. The fact that the surface disturbance is very minimal indicates that regional impacts on water quantity and quality are also minimal. This conclusion is supported by an examination of a watershed such as the Parachute Creek Basin. The U.S.

Geological Survey (USGS) collected water quality information in the late 1970's and early 1980's close to the mouth of Parachute Creek. This gage information was collected prior to any oil and gas activity in the Parachute Creek Watershed. Sediment loads ranged from a maximum daily load of 82,000 tons on July 31, 1976 to a minimum daily load of less then 0.005 tons on many days during 1977. Salinity levels as measured by conductivity varied from a maximum of 3,440 micromhos on June 4, 1977 to a minimum of 811 micromhos on May 21, 1980.

The 1991 FEIS estimated that the average sediment contribution from public lands to surface waters is one ton per acre per year. Public lands in the Parachute Creek Basin contribute an estimated 2,780 tons of salt annually from the Parachute Creek watershed to the Colorado River. To date, oil and gas development has resulted in an estimated 150 acres of disturbance in the Parachute Creek watershed on public land. An additional 445 acres have been disturbed on private land, 595 acres of the total 141,000 acres in the watershed. Any increase in sediment loads, salinity, or other degrading impacts to water quality from the present level of oil and gas development in the Parachute Creek Basin would not be distinguishable from the background levels measured by the USGS in the late 1970s and early 1980s.

When impacts from oil and gas development on federal mineral estate throughout Region 4 are viewed from the perspective of natural erosion and other man caused erosion, any impacts from oil and gas development have been minimal and not distinguishable from background levels.

Cumulative short-term and long-term impacts to surface waters resulting from oil and gas development in Region 4 have been minimal. Most of the area being developed is dry with runoff only occurring occasionally throughout the year. When runoff events do occur, sediment, salt, and other pollutant increases coming from oil and gas facilities cannot be distinguished from those coming from undisturbed areas in the rest of the basin.

4.9.1.2 Future Impacts

4.9.1.2.1 Continuation of Current Management Alternative

Under the Continuation of Current Management Alternative, the same mitigation measures that protect the soil resource and riparian areas also serve to protect water quality. A NSO stipulation on critical watershed areas identified in the RMP and three CSU stipulations, one aimed at maintaining site productivity and controlling erosion in highly erosive soil areas, one aimed at maintaining productivity and controlling erosion on sites with slopes over 40 percent, and a third protecting perennial streams, offer additional protection to surface water. It is anticipated that 300 new wells would be drilled on public land in the next 20 years in Region 4. The resulting surface disturbance is estimated at 1,020 acres, (Table 4.8-1, Soils). This surface disturbance would result in a short-term increase in sediment and salinity in surface waters and a potential increase in peak flows.

In the short-term, 3.4 acres per well would be disturbed and two acres of these would be remediated. Impacts to water quality would be expected to return to the same level on the remediated area as surrounding areas in natural condition. In the long-term, 1.4 acres per well would not be rehabilitated, but would be required for well maintenance during the life of production. These working surfaces could contribute a minimal increase in sediment, salt, and, potentially, peak flows over the life of the well. The intensity and duration of these impacts would be reduced by effective operational mitigation measures, including water bars for roads, siting locations and roads away from drainages, maintaining riparian buffers, and others.

4.9.1.2.2 Maximum Protection Alternative

Under the Maximum Protection Alternative, the same mitigation measures that protect the soil resource and riparian areas would also protect water quality. These mitigation measures include a NSO stipulation for oil and gas development on highly erosive soils, a NSO stipulation on slopes over 35 percent, NSO stipulations for the protection of the Debris Flow Hazard Zones, Water Quality Management Areas and Municipal Watersheds, and a NSO stipulation on riparian areas (including a 500 foot buffer). Additionally, a Site Disturbance and Stability NSO, with exceptions, on slopes greater than 25 percent would ensure that the sites on steep slopes are managed for maximum reclamation potential. All of these stipulations would offer expanded protection to surface water quality.

The anticipated short-term and long-term impacts to soils under the Maximum Protection Alternative would be slightly less than those described in the Continuation of Current Management Alternative. A projected 280 wells would be drilled, resulting in impacts on an estimated 952 acres of public land.

This reduction in surface disturbance would result in slight reductions of the short-term increase in sediment and salinity in surface waters and in the potential for increased peak flows. The intensity and duration of all impacts would be further reduced by effective operational mitigation measures, including water bars for roads, siting locations and roads away from drainages, maintaining riparian buffers, and others.

4.9.1.2.3 Proposed Action

Under the Proposed Action, the same mitigation measures that protect the soil resource and riparian areas would also protect water quality. These measures include a NSO stipulation on slopes over 35 percent with an exception for short stretches of road, NSO stipulations to protect Municipal Watersheds and Debris Flow Hazard Zones, a NSO on riparian vegetation (with a CSU on the associated buffer area), a CSU stipulation on highly erosive soils, including areas identified in the RMP as Erosion Hazard Areas, and a Site Disturbance and Stability CSU on slopes greater than 25 percent to ensure that sites on steep slopes are managed for maximum reclamation potential. All of these stipulations would offer protection to surface water quality.

The regional impacts to surface water under the Proposed Action would be about the same as those for the Continuation of Current Management Alternative and the Maximum Protection Alternative. Management of the local effects of surface disturbance would be better under this alternative than the Continuation of Current Management Alternative and only slightly less effective than the Maximum Protection Alternative. A projected 290 wells would be drilled, resulting in an estimated 986 acres of new disturbance on public land. This reduction in surface disturbance would result in slight reductions of the short-term increase in sediment and salinity in surface waters and in the potential for increased peak flows. The intensity and duration of these impacts would be reduced by effective operational mitigation measures, including water bars for roads, siting locations and roads away from drainages, maintaining riparian buffers, and others.

4.9.1.2.4 Preferred Alternative

Under the Preferred Alternative, the same mitigation measures that protect the soil resource and riparian areas would also protect water quality. These measures include a NSO stipulation on slopes over 50 percent, NSO stipulations to protect Municipal Watersheds and Debris Flow Hazard Zones, a NSO on riparian vegetation (with a CSU on the associated buffer area), a CSU stipulation on highly erosive soils and slopes over 30 percent (this stipulation includes areas identified in the RMP as Erosion

Hazard Areas). All of these stipulations would offer protection to surface water quality.

The regional impacts to surface water under the Preferred Alternative would be about the same as those for the other three alternatives, minimal. Management of the local effects of surface disturbance would be better under this alternative than the Continuation of Current Management Alternative and only slightly less effective than the Maximum Protection Alternative or the Proposed Action. A projected 290 wells would be drilled, resulting in an estimated 986 acres of new disturbance on public land. This reduction in surface disturbance would result in slight reductions of the short-term increase in sediment and salinity in surface waters and in the potential for increased peak flows. The intensity and duration of these impacts would be reduced by effective operational mitigation measures, including water bars for roads, siting locations and roads away from drainages, maintaining riparian buffers, and others.

4.9.1.3 Cumulative Impacts

Cumulative short-term and long-term impacts to surface waters resulting from oil and gas development in Region 4 would be of the same type but greater in magnitude than those that have occurred to date. The impacts would however continue to be minimal. Most of the area being developed is dry with runoff only occurring occasionally throughout the year. When runoff events do occur, sediment, salt, and other pollutant increases coming from oil and gas facilities are indistinguishable from those coming from undisturbed areas in the rest of the basin.

An assumed 1,200 wells would be drilled in the next twenty years in Region 4. The new wells would cause a surface disturbance of an estimated 4,080 acres. Approximately 1,020 acres of public land and 3,060 acres of private land would be disturbed. This surface disturbance would result in a short-term increase in sediment and salinity in surface waters and a potential increase in peak flows. The intensity and duration of these impacts would be reduced to the extent that effective operational mitigation and reclamation measures are pursued.

4.9.2 Groundwater

4.9.2.1 Impacts to Date

No noticeable impacts on BLM-managed mineral estate have occurred. However, in September, 1997, a well being drilled on private mineral estate in Township 7 South, Range 94 West, Section 4, encountered a gas "kick," which resulted in an underground blowout. It resulted in contamination of a private water well located about 3,800 feet to the northeast. The operator is conducting a sampling project in the vicinity of the contaminated well to determine the extent of contamination and to monitor water quality changes (Maxxim, 1998). A nearby replacement well and six observation wells about 500 feet away were drilled. Initial results indicate elevated benzene and methane levels, which were reported at 0.4 and 12.6 mg/l, respectively, in the replacement well. However, since the initial readings, biodegradation appears to have significantly lowered the concentrations of benzene. There is no additional information on the methane levels. Sampling of 20 other domestic wells in the vicinity indicate that no other wells were impacted. Except for this incident and the replacement and observation wells, there has been no known contamination of any other water wells as a result of gas drilling operations in the area.

Due primarily to this incident, the COGCC has identified an area consisting of 31 sections in Township 6 South, Range 94 West, in the Rulison Field as being more fractured and having higher pressures than normal for the region, requiring special consideration. New wells located within this "overpressured area," that are drilled to the Williams Fork Formation, are now required to have surface casing set to a depth of 1,100 feet. This depth allows the operator to better manage the gas pressures. In addition, the lower part of the surface casing should be set into more competent rock. Also in response to this incident, the COGCC performed a study to determine the adequate surface casing setting depths for all other Williams Fork Formation wells in Garfield County. Initially, surface casing leak-off tests designed to determine the integrity of the surface casing shoe were required on all wells. Based on the evaluation of leak off test data, drilling histories, and reservoir parameters, various notices were issued regarding the setting depth of surface casing. As of July 24, 1998, the following requirements apply to Williams Fork formation wells:

- Surface casing must be set at a minimum depth of 1,100 feet in the Rulison Field Overpressured Area (Township 6 South, Range 94 West, Sections 9, 15-23, 26-35 and Township 7 South, Range 94 West, Sections 2-6, 8-10, 11,15, 16);
- Surface casing must be set at a minimum depth of ten percent of the total depth of the well for all fields outside of the Rulison Field Overpressured Area with the exception of the Grand Valley Field;
- Surface casing must be set at a minimum depth of 300 feet in the Grand Valley Field (Township 6 South, Range 96 West, Sections 7-36, and Township 7 South, Range 96 West, Sections 1-24).

The surface casing setting depths will continue to be evaluated and future changes in the required setting depths may occur.

In the Rulison Field, the gas production zone is generally at least 5,000 feet below any usable water zones plus the surface casing is cemented across any shallow water zones. Within the overpressured area, new wells should now be buffered by at least 800 feet of strata between the base of the surface casing and the lowermost aquifer.

The COGCC also requires Bradenhead pressure testing access to the annulus in certain circumstances. This allows the gas pressures to be monitored for possible leaks, on an as-required basis. Moreover, although the Wasatch G Sands are not producible, BLM also requires cementing and isolating across these zones because they do contain some gas.

4.9.2.2 Future Impacts

Little impact to groundwater resources is anticipated from BLM-approved gas drilling operations under all alternatives. BLM, Colorado Oil and Gas Conservation Commission (COGCC), and operators all implement procedures to protect the groundwater resource. As additional information becomes available, current drilling and completion techniques will continue to be evaluated and modified as necessary to assure continued protection of the groundwater resource. BLM procedures prior to APD approval include a groundwater review by a geologist, and require that any shallow water zones and aquifers be isolated and protected behind cemented surface casing. This creates an impermeable barrier between the casing and the hole wall (annulus) which prevents migration of gas and fluids into any water zones.

Additionally, all usable water zones encountered below the surface casing and all prospective gas zones, including the Wasatch G Sands for public lands, are required to be isolated and protected with cement. Based on the depth of the water wells and thickness of the alluvium and other surficial deposits, most of the gas wells drilled in the past within this region have been set with 300 to 600 feet of surface casing, with the base of the surface casing set into bedrock in the Wasatch Formation. The surface casing is therefore set through the water zones offering protection from the drilling operations.

In 1997, the COGCC issued a contract for the analysis of 111 water wells, springs, and stock ponds located across the Piceance Basin in Mesa and Garfield Counties. the purpose of the study was to establish baseline water quality for this portion of the Piceance Basin. An additional 40 water samples taken from water wells, springs, and creeks were analyzed in 1998.

Since domestic water wells are located on private lands, there is a lowered potential for impacts to water wells from operations on public lands, except on split estate lands (private surface/ Federal minerals), where domestic wells may be found. The highest potential for impacts in the region is probably within the Porcupine Creek area because the area includes Federal mineral estate within the overpressured area with high levels of gas well development and overlaps areas favorable for containing usable groundwater.

In summary, the overall potential for contamination of usable water zones and domestic water wells from operations on public lands is considered to be very low. This conclusion is based on several factors: the small number of domestic wells and the limited exposure of water-bearing zones on public lands; the existing and updated requirements for isolating and protecting usable water zones; and testing and monitoring requirements as needed.

4.10 Forestry

This discussion supplements the existing impact discussion presented in the FEIS on page 4-15.

Outside Region 4 the effect on forest types would be minimal, considering the low level of present and projected oil and gas development. The expected loss of Piñon-Juniper or Oak woodlands from oil and gas access road and wellpad construction within Region 4 is relatively minor when compared to the extensive amount and distribution of the woodland types. Future impacts under all alternatives are expected to be similarly minor in nature and extent.

4.11 Recreation

This section supplements the FEIS, Chapter 4, Environmental Consequences, Recreation, pages 4-15 and 4-16.

4.11.1 Impacts to Date

Impacts of oil and gas development activities on recreation values on BLM lands to date are limited to Region 4, and include changes in the overall character of the recreational setting in some dispersed recreation areas where new roads and well sites have been developed. Many of these areas lack public access, with the exception of Porcupine Creek basin. Construction of roads and wellpads has made some public lands, especially in the five high impact areas, appear less natural and remote, and has increased the likelihood that a visitor would encounter other visitors, most likely on motorized vehicles. In some cases, oil and gas development has increased public access to public lands for recreational use.

4.11.1.1 Cumulative Impacts

Cumulative impacts of oil and gas development throughout Region 4, including the private lands, are similar to the impacts to date described for public lands in 4.11.1. except the extent of such impacts is greater. However, most private lands in the Region 4 area are not open for recreational use by the public. Some lands are open to public use, primarily for big game hunting, with permission, for a fee or through contracts with Outfitters and Guides who own or lease the private land.

4.11.2 Future Impacts

4.11.2.1 Continuation of Current Management Alternative

Recreation opportunities on lands with the highest recreation values would be protected by NSO stipulations on public lands in the Special

Recreation Management Areas and ACECs, including the Upper Colorado and Eagle Rivers, Hack Lake, Deep Creek, Bull Gulch, Thompson Creek and around Sunlight Peak. Additionally, recreation values found in the WSAs would be protected by the no leasing status of those areas, at least during the period of interim wilderness management.

Non-motorized recreation values in places outside these areas may be affected by road construction and a change in the overall recreation setting if oil and gas development occurs within them. Construction of roads and wellpads makes an area appear less natural and less remote and increases the likelihood that the visitor will encounter other visitors, most likely on motorized vehicles.

Public lands that provide dispersed recreation opportunities in a more motorized setting would see some changes to the overall character of those lands if oil and gas development were to occur, though no substantial impacts are expected. These impacts would be less noticeable in areas with more roads and regular motorized vehicle traffic.

Overall, impacts to recreation would include a relatively high degree of change to the overall character of those lands affected by oil and gas development. How these changes to the landscape character are viewed by visitors to public lands and how such changes affect recreation experiences depends on the perspective of the visitor. Those more inclined to enjoy operating motorized vehicles and who expect to encounter other visitors when using public lands will not likely view these changes in a negative manner. In fact, some may view increased access to public lands as a benefit. Those who prefer more natural settings with fewer visitors and less obvious human-caused landscape modifications would more likely view these changes as negative.

One of the primary recreation activities on BLM lands in Region 4 is big game hunting and fishing. Hunting and fishing activities are important contributors to the economy of Colorado. For example, according to one model, hunting and fishing activities generate over 30 million dollars annually in Garfield County alone (Browne, Bortz, and Coddington, Inc., 1998).

The impacts on hunting and fishing opportunities, and associated revenues, resulting from oil and gas development is unclear. As described in the Draft SEIS, many factors influence the capacity of the environment to support wildlife, fish and other resources, including residential, commercial and transportation developments, fire suppression and use of Off-Highway Vehicles. Other land use practices obviously affect the natural environment as well, like farming, forest management, oil and gas development, and recreational developments like ski resorts. Factors such as road densities, amounts of visitor use, and weather must also be considered. Obviously, some habitat modifications might positively influence one species of wildlife while negatively influencing another species. Species interaction, the role of predators, natural population cycles, and uncertain population data complicate such an assessment even further. Based on the abundance of factors that contribute towards the lands overall capacity to support wildlife and fish as well as other resources, it difficult to predict with any certainty the impact of a particular factor on the number of a certain species and thus there would be little basis for BLM to try to predict the impact of oil and gas activities on big game hunting.

4.11.2.2 Maximum Protection Alternative

Recreation values in the SRMAs, ACECs and WSAs would be protected by the NSO and/or no leasing status for these high priority recreation areas. The newly designated Bocco Mountain and Gypsum Hills SRMAs are not included in the NSO because of their Semi-primitive Motorized and Roaded Natural management class, which would not be affected by oil and gas activities. Adverse impacts from oil and gas development would be minimized in several other Recreation Management Areas as well. These areas are managed for non-motorized recreation opportunities consistent with the travel management objectives previously established by the BLM in prior planning processes or through previous travel management orders. These Recreation Management Areas include Pisgah Mountain, Castle Peak, Bull Gulch, King Mountain, Siloam Springs and Haff Ranch. Impacts to recreation opportunities outside the SRMAs, ACECs, WSAs and Recreation Management Areas would remain the same as in the Continuation of Current Management Alternative.

4.11.2.3 Proposed Action

Impacts would be similar to those under the Maximum Protection Alternative, though exceptions to the NSO for the Recreation Management Areas would facilitate some limited oil and gas development. Such uses would be permitted only of they had minimal effects on non-motorized recreation values.

4.11.2.3 Preferred Alternative

Impacts to recreation values are expected to be similar to those described for the Proposed Action Alternative. Highest priority recreation values in the SRMAs, ACECs, WSAs and Recreation Management Areas would be protected .

4.11.2.4 Cumulative Impacts

Cumulative Impacts of 1200 wells on private and federally-owned mineral estate in Region 4 are similar across all alternatives. The overall character of the landscape will continue to change from a more natural setting to a more industrial setting. Construction of roads and wellpads will make areas appear less natural and less remote and increases the likelihood that the visitor will encounter other visitors, most likely on motorized vehicles.

These impacts would be less noticeable in areas with an already high density of existing roads which currently receive regular motorized vehicle traffic.

As oil and gas developments dominates greater portions of the landscape, opportunities for more primitive types of recreation will diminish. However, given the rather extensive network of roads already established and the trend towards residential subdivision of private property, opportunities for more primitive recreation are already somewhat limited . Overall, impacts to such recreation opportunities from oil and gas development are not significant, except for perhaps in certain local areas.

Cumulative impacts of oil and gas development outside Region 4 are expected to be negligible since only eighteen wells are anticipated on BLM lands outside Region 4 within the next 20 years. Continued residential and commercial development is expected to affect recreation opportunities to a much greater degree than oil and gas development outside Region 4.

4.12 Visual Resources

This Section supplements the discussion of Visual Resources in the FEIS, Chapter 4, page 4-18.

4.12.1 Impacts to Date

The visual impact to date was evaluated by analyzing the visibility and visual sensitivity of the locations of wells and related access roads. Gas development features in areas that are moderately to extremely visible are potentially noticeable from a wide-ranging area, and may contribute to changes in the character of the landscape in a given area. Gas development sites in areas that are seldom seen or which receive low visibility are likely to be noticed from relatively few places, and consequently have limited, localized visual impacts. Some wells on National Forest system lands are in locations visible from the key viewing areas, but viewing distance is over fifteen miles away and their visual impact is not discernible due to local screening.

The visual impact of gas development activities generally depends on the character of the landscape and the visual contrast of modifications to the landform and vegetation features, and the size, color and shape of structures. During gas well drilling operations, newly constructed pads and roads with bare cut-and-fill slopes are noticeable and attract attention. The drilling derrick and related equipment, flaring operations and associated traffic also attract attention and are noticeable from a distance. Most drilling equipment is painted some light color that stands out, and the sites are usually brightly lit at night. After drilling and during well production, visual impacts mainly consist of the pad, access road and associated cut-and-fill slopes, tank batteries and meter shacks, and in some cases above-ground pipelines. Visual impacts after a well is abandoned are mainly related to the ground disturbance from re-grading the pad site and road to roughly original contours, if that is done. If the wells are abandoned without re-contouring, visual impacts would be mainly from the pad and any cut-and-fill slopes.

The visual impact of wellpad and access road construction is greatest on sloping ground, with the size of the total disturbance depending on the ground slope and the steepness of the cut-and-fill slopes. Grading of a flat area approximately 200 by 300 feet for a typical pad is required to accommodate drilling operations. On flat ground, a drilling pad may disturb about 1.5 acres while on 40 percent slopes it can disturb up to five acres if the cuts are at the desirable 2.5:1 to 3:1 slope. Earthwork in areas where the subsoil color contrasts highly with the ground surface color is readily noticeable even at great distances and is likely to attract attention. Grading also creates new lines and surfaces of different aspects, and different surface textures which contribute to the visual impact.

Vegetation clearing required for wellpad, road and pipeline construction creates openings or swaths through the cover. Generally, in all vegetation types, the visual impacts of clearing are most noticeable in the first five years after construction when the revegetated cover and natural types differ most. Visual contrast of clearings is greatest in the dark colored vegetation types with dense cover where the changes in type, colors and edges are high and sharply defined. Wellpads and roadsides on public lands are typically required to be revegetated under lease stipulations, which is typically accomplished with grasses and forbs that contrast sharply with shrub and tree cover types because of their smaller scale, lighter colors and finer texture. The visual contrast of revegetated areas attenuates as shrub cover becomes established over time. The time it takes for revegetation to blend in with surrounding vegetation depends on site conditions and the success in getting plant materials to grow. Poor soil conditions and steep cut-and-fill slopes usually result in poor revegetation and longer lasting visual impacts.
In a producing field, ancillary facilities such as pumping and compressor stations also cause visual impacts that are noticeable and attract attention. These facilities can be large and occupy several acres, and can be seen along I-70 west of Rifle. Painting structural features with flat finish and colors which blend with the surroundings helps reduce their visual impact and is used successfully in some well production facilities. The visual impact of current gas development in each of the viewsheds is summarized below.

Battlement Mesa Views. Of the 66 potentially visible well sites, fourteen are on BLM and thirteen on NOSR Production Area lands; 39 are on private land. Of the total, 53 are in highly sensitive locations and 27 are in a VRM Class II area. Some have noticeable visual impact but few attract attention. Viewing distance is two to five miles which reduces the scale of the visual impact, and the landscape is highly textured by local relief and sparse vegetation, tending to screen and attenuate the visual contrast. The wells that are noticeable are in dense woodland on terraces northeast of Parachute and where the clearings for roads and pipelines are highly visible. Some gas development sites exceed BLM's VRM objectives.

Highway 13 Views. Of the 37 potentially visible sites, five are on BLM, sixteen are on National Forest lands, and the remainder on private land. Four of the sites are in highly sensitive locations but they are in VRM Class IV areas. However, their visual impact is not noticeable due to viewing distance ranging over three to five miles and local screening. Overall, VRM objectives are being achieved.

Holms Mesa Views. Of the 110 well sites potentially visible from Holms Mesa, seventeen are on BLM, eighteen on NOSR Production Area lands, and 75 are on private land. Seventy-one of the total are in highly sensitive locations and 28 are in a VRM Class II area. Most are located in the sagebrush and greasewood parks along I-70 and the surrounding slopes. The visual contrast of many of these wells is high and they are noticeable and attract attention. Viewing distance to most of the well sites is from two to five miles, with a few wells visible at less than a mile away. Due to the elevation of Holms Mesa, many of the well sites are seen from above, increasing the visual impact of the pads, roads and pipeline clearings particularly in the Sharrard Park area. Development in the Sharrard Park area exceeds VRM objectives.

Interstate 70 Views. Of the 182 well sites potentially visible along I-70, nineteen are on BLM, thirteen are on NOSR Production Area lands, a few are on Forest Land and 145 are on private property. Of the sites on private land, 21 are on split estate. There are 162 sites in highly sensitive locations and 83 in VRM Class II areas. Most of these wells are found along the ten mile stretch between Parachute and Rifle, with the most noticeable concentrations around Webster Mesa and Sharrard Park. Landform and vegetation characteristics screen or buffer the visual impact of wells that are far from the highway, but the visual contrast of many wells in the foreground attracts attention, particularly in the open sagebrush and greasewood parks, and dense PJ woodland on slopes facing the viewers. Visual impact of gas development in the foreground between Rifle and Parachute exceeds VRM objectives.

Parachute Creek Views. Of the 48 well sites potentially visible in Parachute Creek, 18, or about a third, are on BLM land and the rest are on private land. Of those on private land, three are on split estate. All sites but one are in highly sensitive locations and eighteen are in VRM Class II areas. Most of the wells are in a five mile stretch from the town of Parachute to Starkey Gulch on the west slope below Mount Callahan. Viewing distance varies from 0.1 to one mile. Local topographic and vegetation texture tends to screen or attenuate the visual impact, and most of the wells away from the county road are not noticeable. Overall, current VRM objectives are being achieved.

Rifle Views. Of the 38 potentially visible well sites, six are on BLM, twelve are on National Forest land, and the rest are on private land. Nine are in highly sensitive locations and three are in a VRM Class II area. Most of these wells are in the vicinity of Webster and Taugenbaugh mesas. Viewing distance to the closest sites is one to five miles away and their visual impact is not noticeable. A gathering pipeline on private land on the mesa slope just south of Rifle is noticeable and attracts attention. Overall, current VRM objectives are being achieved.

4.12.2 Impacts of Future Development

4.12.2.1 Continuation of Current Management Alternative

With the assumed gas well development and a continued pattern of well site locations, all of the viewsheds will be affected by a noticeable increase in visual impacts from gas development. Those impacts would be reduced on the NOSR Production area by the existing CSU stipulation on VRM Class II areas. With this stipulation, operators may be required to implement special visual mitigation measures or even relocate a proposed well site by a distance over 200 meters if needed to prevent unacceptable visual impacts. The visual impacts of development under existing leases could be reduced somewhat by COAs applied on APDs, or cooperative voluntary efforts of the lease operators. However, relocation of proposed facility sites may not exceed 200 meters and visual impacts would be unavoidable in some locations. The possible visual impacts in each viewshed are summarized below.

Battlement Mesa Views. Of the potentially visible well sites, 35 might be on BLM and 33 on NOSR Production Area lands, and 98 on private land. Approximately 165 well sites may occur in the Battlement Mesa viewshed, with about 133 in highly sensitive locations and 68 in the VRM Class II areas. Potential wells in the denser PJ woodland will be the most noticeable, particularly on the side of High Mesa and on the terraces around Parachute, and the most likely to exceed VRM objectives. The visual impact of many of the wells is likely to be attenuated by terrain and vegetation conditions.

Highway 13 Views. Of the 93 well sites potentially visible from Highway 13, thirteen might be on BLM, 40 on National Forest lands, and the rest on private land. Approximately ten well sites may occur in highly sensitive locations and a few in the VRM Class II areas. The visual impact of most of these wells is not likely to be noticeable due to far viewing distance and screening. Overall, VRM objectives are likely to be achieved for this viewshed.

Holms Mesa Views. Of the approximately 275 well sites that might be visible form Holms Mesa, about 43 are likely to occur on BLM, 45 on NOSR Production Area lands, and 88 on private land. Perhaps 178 would be in highly sensitive locations and about 70 in VRM Class II areas. Because of the landscape exposure and viewing angles, many of these wells may be noticeable and attract attention and are likely to exceed VRM objectives, particularly in the Sharrard Park area.

Interstate 70 Views. Of the approximately 455 well sites potentially visible along I-70, about 48 might occur on BLM, 33 on NOSR Production Area lands, and 363 on private property. Of those on private land, 53 may occur on split estate. About 405 might be on highly sensitive locations and 208 in VRM Class II areas. The concentration of visual impacts will increase and be most noticeable in the stretch between Rifle and west of Parachute. The visual impact of gas development in the foreground west of Rifle will change the character of the existing rural agricultural scenery to a more heavily industrialized character.

Parachute Creek Views. Of the approximately 120 potentially visible well sites, 45 may occur on public land with the rest on private land and about eight on split estate. About 118 could be in highly sensitive locations and 45 in VRM Class II areas. Many of the new wells are likely to be screened or buffered by local topographic and vegetation conditions, but some are likely to be noticeable and attract attention, potentially exceeding VRM objectives.

Rifle Views. Of the approximately 95 well sites potentially visible from Rifle, sixteen may occur on public land, 30 on National Forest land, and the rest on private land. About 23 could be in highly sensitive locations and eight in VRM Class II areas. The visual impact of most of them is not likely to be noticeable due to great viewing distance and screening or buffering by landscape features. Development on the slopes below Flatiron Mesa south of town would be the most likely to exceed VRM objectives.

4.12.2.2 Maximum Protection Alternative

The visual impact of assumed gas development under new leases, including those in the NOSR Production Area, would be minimized by a NSO stipulation on visually sensitive lands over 25 percent slope in the I-70, Battlement Mesa, Holms Mesa, Rifle and Highway 13 viewsheds. Visual impacts would also be reduced by the CSU stipulation on visually sensitive lands under 25 percent slope within these same viewsheds and by the application of the CSU on VRM Class II areas. Practically all visible lands would be subject to a NSO or a CSU to protect visual values, forcing development activities to locations hidden from view. The size or scale of the landscape modifications from wellpad and road construction would be reduced by favoring development on flatter ground, and modifications would be prevented on the most sensitive landscape features on public land. However, the visual impact of gas development will be noticeable nevertheless, particularly in the immediate foreground views and on lands not subject to BLM restrictions. Approximately fifteen of the 70 assumed potential well sites in the NOSR Production Area would not be developed, partly because of the NSO on visually sensitive slopes. In areas where existing leases predominate, some of the visual impact of gas development leases in all of the viewsheds would be reduced by efforts to address visual concerns during the APD review process. However, VRM Class II objectives may be exceeded in some places where opportunities for minimizing visual impacts are not available.

4.12.2.3 Proposed Action

The visual impact of assumed gas development under new leases, including those in the NOSR Production Area, would be minimized by the NSO stipulation on visually sensitive lands over 25 percent slope in the I-70 viewshed. This NSO would only be applied on the I-70 viewshed, and would not cover as much land as under the Maximum Protection Alternative which also included the Battlement Mesa, Holms Mesa, Rifle and Highway 13 viewsheds. However, protection of all viewsheds would be provided by a CSU stipulation on lands under 25 percent slope in the I-70 viewshed and visually sensitive lands in the Battlement Mesa, Holms Mesa, Rifle and Highway 13 viewsheds. Additionally, visual resource protection would be provided by the CSU on VRM Class II areas resource area wide. Approximately five of the 70 assumed potential well sites in the Production Area would not be developed, partly because of the NSO on visually sensitive slopes. In areas where existing leases predominate, some of the visual impact of gas development under existing leases in all of the viewsheds would be reduced by efforts to address visual concerns during the APD review process. However, VRM Class II objectives may be exceeded in some places.

4.12.2.4 Preferred Alternative

The Preferred Alternative maintains Visual impacts would be minimized by a NSO stipulation in the I-70 viewshed on visually sensitive lands over 30 percent slope. The slope threshold for the VRM NSO stipulation is changed to be consistent with other slope criteria to simplify management. The extent of the lands covered by this NSO would be similar to that under the Proposed Action, but lands between 25 percent and 30 percent would not be covered. All visible lands under 30 percent slope in the I-70 viewshed would be under a CSU stipulation to minimize visual impacts, and the CSU on VRM Class II lands would provide additional protection Resource Area-wide.

4.12.3 Cumulative Impacts

Visual impacts of gas development on public lands and non-public lands in Region 4 will continue to become more noticeable as new roads and well sites are developed. The impacts will be most noticeable in the foreground-middleground views. In areas of concentrated development, the character of the existing landscape will be increasingly affected gas development modifications, changing it to a more industrialized setting. Mitigation efforts on public land will reduce visual impacts on the most sensitive landscape features, helping retain the existing landscape character. However, VRM Class II objectives are likely to be exceeded in some places where opportunities for visual impact mitigation are limited by valid existing rights or landscape characteristics, particularly on existing leases. Visual impacts of future gas development on private lands will contribute the most to the change in the character of the landscape along I-70 and other important viewsheds in Region 4, with wellpad, road and pipeline construction likely to be noticeable and attract attention in many instances.

Since most of Region 4, except the NOSR Production Area, is leased without stipulations specifically to protect visual resources, BLM will have a much more difficult time in achieving VRM objectives in the area where most of the gas development activity is expected to occur. Through out the Region, gas development features will contribute to the modification of the existing landscape currently being experienced due to by a variety of other land uses, including residential, commercial and other industries. With the proposed mitigation, future gas development on the NOSR Production Area will be generally consistent with VRM Class II objectives for the I-70 viewshed, but there may be instances where construction of an individual wellpad or access road could exceed visual contrast limits for this VRM class. This may be acceptable on public lands where the character of the immediate project area is already highly modified by prior development, for example, on a small tract of public land surrounded by highly modified private property. In these instances, although the project may modify onsite conditions, its visual impact might not be noticeable or attract attention and contribute only slightly to the overall landscape character.

4.13 Cultural Resources

This section supplements the FEIS, Chapter 4, Environmental Consequences, Cultural, page 4-18 and 4-19.

Direct effects are held to a minimum by identifying cultural resources early in the planning process. Early identification is accomplished by conducting a record search and intensive (Class III) ground survey of any areas of potential effect prior to the issuance of any permit. In most cases, the project can be planned to avoid affecting the resource.
In those few cases where a significant resource cannot be avoided, a mitigation plan must be developed with the Authorized Officer and, in the case of cultural resources, the State Historic Preservation Officer. Mitigation may be expensive and time consuming. The costs of mitigation are borne by the project proponent. Mitigation may involve the relocation of the disturbance in excess of 200 meters or excavation, recording and analysis of the cultural resource. Site excavation is a destructive form of mitigation and is done only if preservation is not possible.

Buried cultural resources may not be detected until the development has begun. Disturbance in deep alluvial soils or near significant sites shall be monitored. If any cultural materials are noticed at anytime, the authorized officer must be notified so the resource can be recorded, evaluated, stabilized, or mitigated. Work in the area of the discovery would stop until notified by the AO to proceed.

Indirect impacts occur when secondary activities affect cultural resources. For example, opening a road may result in increased recreational use, which could lead to unauthorized collection or vandalism of cultural resources. Changes in drainage patterns, erosion or altered livestock movements by construction or modification of fencing might also lead to site impacts. Indirect impacts are minimized by the use of gates on newly constructed roads to minimize traffic into an area, educating industry workers and subcontractors about the importance of leaving cultural resources in place, and erosion control measures.

Beneficial impacts of development include increased inventories of acreage and sites as prescribed in Section 110 of the National Historic Preservation Act. The increased inventory and recording may improve the understanding of the history and prehistory of the region. Avoidance and protection of significant sites will continue. Identified sites can be better managed and protected than unknown sites.

The Northern Ute, Southern Ute and Ute Mountain Ute have been asked to express any concerns during the development of this supplemental environmental impact statement and no comments were received. When traditional cultural properties or sacred sites are identified within areas of potential development, the sites will be avoided whenever possible. In cases where there may be an effect on a traditional cultural property or sacred site, consultation will be carried out with the Ute tribes to identify acceptable alternatives.

4.13.1 Impacts to Date

Direct impacts have been minimal because of the consistent application of the prescribed identification, avoidance and mitigation measures. It is uncertain to what extent indirect impacts have occurred because little evaluation has been done. The risk of indirect impacts can be minimized by managing access and through education.

4.13.2 Impacts of Future Development

4.13.2.1 All Alternatives, including the Preferred Alternative

Under all alternatives, direct impacts will continue to be minimal because of consistent application of the prescribed identification, avoidance and mitigation measures. Indirect impacts would be minimized by managing newly developed access and through education of industry workers about the importance of leaving cultural resources in place

4.14 Paleontological Resources

This section supplements the FEIS, Chapter 4, Environmental Consequences, Paleontological Resources, page 4-19.

Direct effects are held to a minimum by identifying paleontological resources early in the planning process, and treating the resources as described in the BLM manual and the BLM Handbook on Paleontological Resources, H8270-1. Prior to authorizing surface disturbing activities, the BLM makes a preliminary determination as to whether potential exists for the presence of fossil material. If potential exists for the presence of valuable fossils, a paleontological survey will be required. Class I and, in some cases, Class II formations are inventoried for fossil localities early in the planning process. In most cases, the project can be planned to avoid affecting the resource. In those few cases where a significant resource cannot be avoided, a mitigation plan must be developed with the AO. Mitigation may be expensive and time consuming. The costs of mitigation are borne by the project proponent. Mapped fossil sites will be protected by applying the appropriate mitigation to the use authorization. Mitigation may involve the relocation of disturbance or excavation and recording of the fossil remains. BLM determines the disposition of any fossils discovered and excavated.

Certain areas may require the presence of a qualified paleontologist to monitor operations during surface disturbing activities. Buried paleontological resources may not be detected until the development has begun. If any fossils are noticed at anytime, the AO must be notified so the resource can be recorded, evaluated, stabilized, or mitigated. Work in the area of the discovery would stop until notified by the AO to proceed.

Indirect impacts occur when secondary activities affect paleontological resources. For example, opening a road may result in increased recreational use, which could lead to vandalism of paleontological resources. In addition, changes in drainage patterns, erosion or altered livestock movements by construction or modification of fencing might lead to impacts. Indirect impacts are minimized by the use of gates on newly constructed roads to minimize traffic into an area, educating industry workers and subcontractors about the importance of leaving paleontological resources in place, and erosion control measures.

Inventory has beneficial impacts for fossils by identifying, recording, and evaluating an increased number of fossil localities. The increased inventory and recording may improve the understanding of the paleontology of the region. Avoidance and protection of significant sites will continue. Identified sites can be better managed and protected than unknown sites.

4.14.1 Impacts to Date

Impacts have been minimal because of the consistent application of the prescribed identification, avoidance, and mitigation measures. It is uncertain to what extent indirect impacts have occurred because little evaluation has been done. The risk of indirect impacts can be minimized by managing access and through education.

4.14.2 Impacts of Future Development

4.14.2.1 Continuation of Current Management Alternative

Under the Continuation of Current Management Alternative scientifically important fossils in the Sharrard Park Paleontological Area are protected by the Standard Terms and Conditions, but have no specific stipulation providing further protection. Direct and indirect impacts could occur to the Sharrard Park fossils. Due to the high density of paleontological localities in the Sharrard Park, the sites might be impacted even if wellpads are relocated 200 meters away. A LN requiring inventory in other Class I or II paleontological areas would apply to all leases. Overall, impacts to paleontological resources are expected to be minimal.

4.14.2.2 Maximum Protection Alternative

Under the Maximum Protection Alternative, a NSO stipulation would apply to the Sharrard Park Paleontological Area . Since most of the area is already leased and under development, compliance with the NSO would be voluntary. A LN requiring inventory in other Class I or II paleontological areas would apply to all leases. Overall, impacts to paleontological resources are expected to be minimal.

4.14.2.3 Proposed Action and Preferred Alternative

Paleontological Resources are protected in both alternatives by a CSU requiring survey and mitigation measures in the scientifically important Sharrard Park Paleontological Area. Since most of the area is already leased and under development, compliance with the CSU would be voluntary. A LN requiring inventory in other Class I or II paleontological areas would apply to all leases. Impacts to paleontological resources are expected to be minimal.

4.15 Wilderness

This section supplements and updates the FEIS, Chapter 4, Environmental Consequences, Wilderness, page 4-19 and 4-20.

4.15.1 Impacts to Date

To date, no impacts to wilderness resources have occurred from oil and gas development. There are no current leases within any of the WSAs or on adjacent lands, and no exploration or development has taken place since the early 1980's when seismic work was conducted in the Castle Peak WSA.

The 1997 transfer of the NOSR to the BLM increased the acreage of public lands within several wilderness inventory units that were dropped from the FLPMA Section 603 wilderness review process because they consisted of small tracts under 5,000 acres or were federal lands not subject to the wilderness review. The transfer of lands has created public land areas over 5,000 acres that have not been previously reviewed for wilderness characteristics. These units include the NOSR Production Area lands which are proposed for lease in this RMP amendment. A supplemental wilderness inventory was conducted for these lands (units CO-070-303 and 307) in October, 1998 to determine if the public lands therein contain wilderness characteristics as defined in the Wilderness Act of 1964. The supplemental wilderness inventory is available for review at the GSRA office.

The supplemental inventory consisted of a review of current available information and resulted in a determination that although the public lands within the inventory units containing the proposed gas lease tracts in the NOSR Production Area are over 5,000 acres, these lands contain numerous improvements which impair the area's naturalness and lack outstanding opportunities for solitude and primitive and unconfined recreation. The inventory units clearly lack wilderness characteristics and further wilderness review is not warranted.

4.15.2 Impacts of Future Development

4.15.2.1 Continuation of Current Management Alternative

No impacts to wilderness resources within the WSAs are expected. Leasing would be precluded in those WSAs eventually designated by Congress as Wilderness. Areas released by Congress for uses other than wilderness would be leased according to stipulations in effect at the time of leasing. No protective stipulations exist on the portion of the Bull Gulch WSA not recommended by the BLM for wilderness designation. Impacts of oil and gas development in the Castle Peak WSA would be reduced by the VRM Class II CSU stipulation but if development occurs it would-result in a loss of natural and semi-primitive non-motorized recreation values.

No impacts to wilderness resources are expected to occur from leasing of the NOSR Production Area since the BLM completed a supplemental wilderness inventory in October, 1998 and determined that the inventory units lack wilderness characteristics.

Should lease tracts be proposed by industry within the area of the Conservationists' Wilderness Proposal for BLM lands, dated January 1, 1994, the review process required by Colorado BLM policy (IM CO-97-044, dated May 19, 1997) would be initiated to determine if those lands contain wilderness values and whether the RMP should be amended to consider protection of those values. Thus, leasing would not occur on any BLM lands included in the proposal until the review process was completed. It is unlikely that lease tracts would be proposed in those areas due to the relatively low mineral potential.

4.15.2.2 Maximum Protection Alternative

Impacts to wilderness resources under this alternative would be the same as under current management, except that a NSO stipulation would protect natural and semi-primitive, non-motorized recreation values within all the WSAs if released by Congress for uses other than wilderness.

Regarding the Conservationists' Wilderness Proposal for BLM lands, all lands included in the proposal within the GSRA, except small parts of the Thompson Creek area have been identified by BLM as either a WSA, ACEC, SRMA or Recreation Management Area. Under this alternative, all such areas would be protected from oil and gas development with a NSO and no impacts to roadlessness values in these areas are expected. Portions of Thompson Creek not covered by the NSO would not be leased prior to the review process described above. Overall, minimal impacts to roadlessness values in these areas are expected, but such a determination would be confirmed per IM-CO-97-044 prior to actual leasing.

4.15.2.3 Proposed Action and Preferred Alternative

Impacts to wilderness resources within the WSAs under both these alternatives would be the same as under the Maximum Protection Alternative.

Regarding the Conservationists' Wilderness Proposal for BLM lands, all lands included in the proposal within the GSRA, except small parts of the Thompson Creek area, have been identified by BLM as either a WSA, ACEC, SRMA or Recreation Management Area. Under both these alternatives, all such areas would be protected from oil and gas development with a NSO, though the NSO provides for some limited exceptions. In the Proposed Action Alternative, some minimal impacts to roadless values might occur given the less than definitive nature of the exception. This vague exception was removed in the Preferred Alternative. As in the Maximum Protection Alternative, portions of Thompson Creek not covered by the NSO would not be leased prior to the review. Overall, minimal impacts to roadlessness values in these areas are expected, but such a determination would be confirmed per IM-CO-97-044 prior to actual leasing.

4.16 Lands and Realty Actions

The Environmental Consequence section for Lands and Realty Actions is found in the FEIS on page 4-20. No further discussion is necessary in this document.

4.17 Transportation

This section replaces the description of the effects of new road construction for oil and gas development found in the FEIS on pages 4-20 and 4-21.

Oil and gas development commonly includes the construction of new roads to access wellpads. Newly constructed roads are the source of much of the impact related to oil and gas development. They make up a major part of the surface disturbance and represent the largest part of the long-term commitment of the soil resource, as roads are often not rehabilitated but left in place. The disturbance created by the road construction could alter the viewshed. Road construction often occurs in or near riparian areas, sometimes crossing streams; this could affect the operation of riparian systems and the quality of surface water. The motor vehicle access provided by new roads increases human activity and traffic in areas that might previously have seen little human activity, potentially resulting in secondary impacts on wildlife, cultural and paleontological resources and on recreation opportunities.

Well drilling rigs and support equipment travel from site to site and may affect local traffic patterns, damage roads, and create safety problems. This issue is primarily related to county roads, under the jurisdiction and control of Garfield County. County roads tend to be narrow, winding roads, designed for farm-to-market, light-volume, light-duty traffic. Oil and gas equipment travelling on these roads often exceeds the designed capacity of the roads, creating safety issues and requiring extra maintenance. There may be substantial new costs for the county associated with this degree of road maintenance.

BLM's road construction standards are applied in the design of access roads. These standards have proven to be effective in mitigating soil erosion problems related to disturbance from construction operations. Actions such as limiting road grades, providing proper water drainage including ditches and culverts, applying surface materials such as gravel, avoiding excessive earthwork and sidecast of materials, and implementing dust abatement techniques can effectively mitigate adverse impacts. BLM requires that the operator obtain all necessary local permits, including the hauling permits required by Garfield County.

If a producing well is found, the road is generally maintained periodically by the operator to provide year-round vehicle access to the site. Maintenance actions such as surface blading, culvert and ditch cleaning, spot surfacing and weed control are required to ensure that road standards are recognized and resource impacts are minimized. In instances when a well is plugged and abandoned, BLM usually requires the rehabilitation and closure of roads related to the site unless overriding benefits to the public dictate that a road remain open for travel. Appendix I, Reclamation, summarizes the disturbance related to wellpad and road development on BLM-administered mineral estate and the subsequent reclamation efforts.

When road development results in improved vehicle access to areas with important resource values which could be adversely affected by motorized users, BLM may require the operator to restrict access to administrative users (BLM and its lessees or permittees) by installing traffic controls such as locked gates. This action may adversely affect the public motorized user.

4.17.1 Impacts to Date

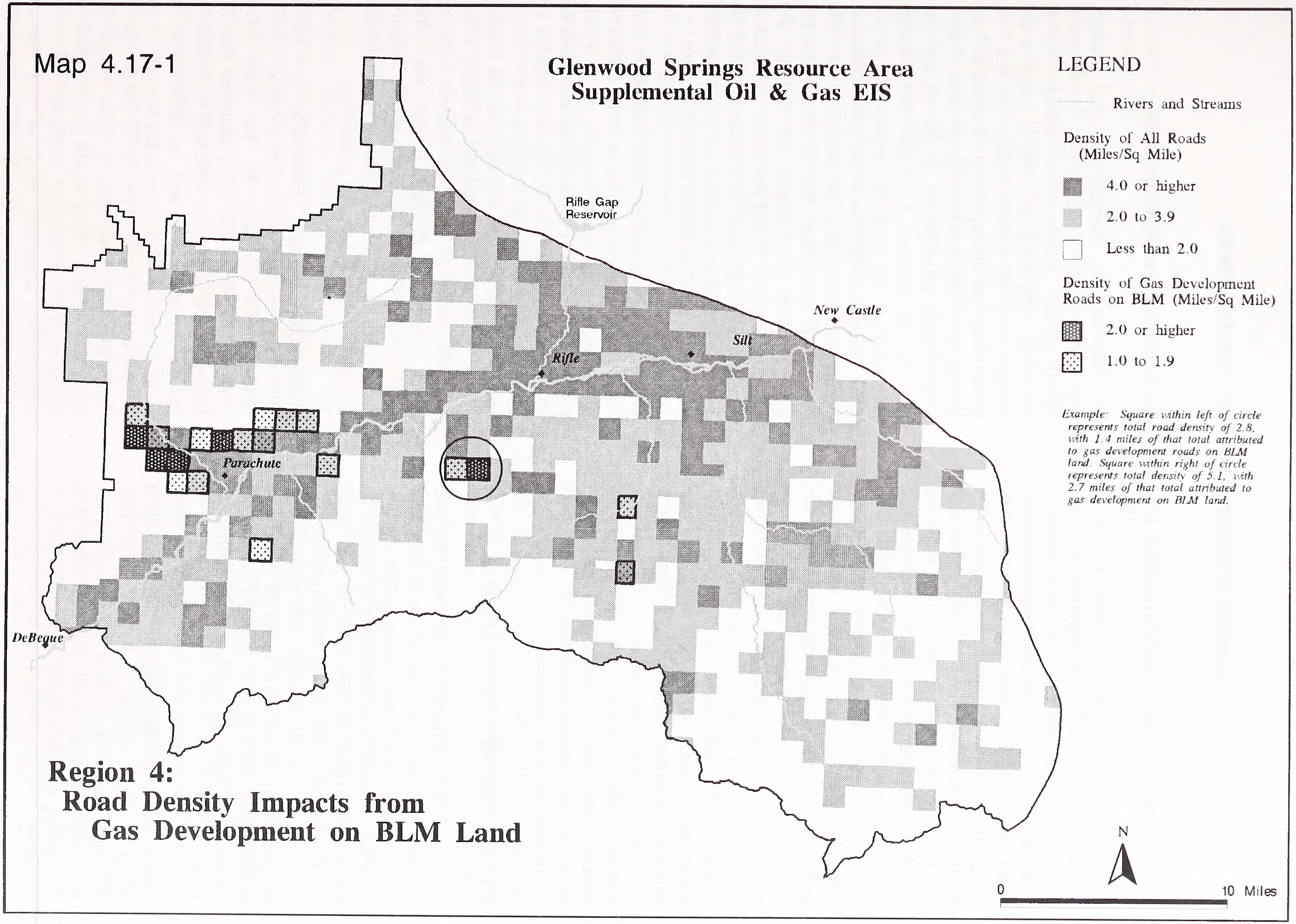
BLM. An assessment was conducted and found that 57 miles of roads have been specifically constructed for oil and gas development on public lands. This is about three percent of the estimated total 2,025 miles of road in Region 4. About 60 percent of the 57 miles were built on public lands and the remaining 23 miles were constructed on private lands, including split estate holdings. This represents 0.36 miles of new road on average for each of the 160 wells drilled on public mineral estate.

An effective method for evaluating the effect of roads in an area is to calculate road densities. The miles of road per square mile in a given area serve as an indicator of the amount of development-related impact that has occurred. Map 4.17-1 displays the road densities in Region 4 and the contribution to density made by development of gas resources on public mineral estate. Road density was calculated by totaling all roads within a section of land and dividing the total miles by the square miles within a section. (The solid gray shades on Map 4.17-1 represent road density categories within Region 4 for all existing roads.) Additionally, roads specifically constructed for oil and gas development on BLM land or mineral estate were totaled, and road densities were calculated for these roads. (The stippled boxes overlaying the gray shades represent the effect of road density contributed by oil and gas development on BLM or BLM mineral estate). The primary area affected by new oil and gas roads on public land lies west and north of Parachute and Rulison, with isolated concentrations located in Porcupine Creek, Mamm Creek, Dry Creek, and

Holms Mesa. In those areas road densities have increased.

Cumulative. Assuming that gas wells drilled on fee lands required, on average, the same amount of new road construction that wells on federal mineral estate required (0.36 miles per well), then the 540 fee wells resulted in the construction of 194 miles of new road. The assumed 194 miles represent about ten percent of the total estimated road distance in Region 4. This is an overestimate since the roads built for fee wells are not included in BLM's road database. Because the roads for fee wells have not been identified and mapped, it is not possible to calculate where or to what degree, gas well roads have increased road density in any particular area.

Traffic increases on many County roads and State/Federal highways because of oil and gas development. Assuming an average of four miles traveled round-trip to a well, 271 round-trips are possible during drilling operations (rig-up, drilling and rig-down) and an estimated 278 round-trips are possible for completion and testing work. These round-trips are conducted by vehicles ranging in weight from 20,000 to 110,000 pounds. For a well with an average four miles round-trip, 904 miles are typically traveled by 20,000 pound vehicles, 432 miles are traveled by 44-48,000 pound vehicles, 88 miles are traveled by 60,000 pound vehicles, and 56 miles are traveled by vehicles in excess of 74,000 pounds. Given the amount of trips at these load ratings, and considering the added impacts related to seasonal weather effects on road surfaces, the cumulative impact on roads and highways from oil and gas development is considerable.



Map 4.17-1

Glenwood Springs Resource Area Supplemental Oil & Gas EIS

Region 4: Road Density Impacts from Gas Development on BLM Land

LEGEND
Rivers and Streams
Density of All Roads (Miles/Sq Mile)
▨ 4.0 or higher
▨ 2.0 to 3.9
☐ Less than 2.0
Density of Gas Development Roads on BLM (Miles/Sq Mile)
▩ 2.0 or higher
⛶ 1.0 to 1.9
Example: Square within left of circle represents total road density of 2.8, with 1.4 miles of that total attributed to gas development roads on BLM land. Square within right of circle represents total density of 5.1, with 2.7 miles of that total attributed to gas development on BLM land.
Rifle Gap Reservoir
New Castle
Silt
Rifle
Parachute
DeBeque
N
0
10 Miles

4.17.2 Future Impacts: All Alternatives

If future well development required the same amount of new roads on average that wells to date have required, then the 300 wells assumed to be developed on BLM-administered mineral estate in the next 20 years would result in 108 miles of new road, perhaps 25 miles of that in the NOSR Production Area. To the extent that an alternative reduces the number of wells or well locations, that amount would be reduced. One-hundred eight miles of road would be a five percent increase over the current total distance of roads in Region 4. This is probably an overestimate of future road development. With the relatively well-developed road systems in place in most of the area of concentrated gas development, the average amount of new roads constructed for each well will probably decrease. It is expected that relatively short road spurs will be the common new road feature as most access roads have been constructed. The use of existing roads, however, can be expected to increase under any alternative, and the amount of traffic, road maintenance actions and cycles would increase concurrently.

4.17.3 Cumulative Future Impacts

If future well development on fee lands required the same amount of new roads on average that wells on public land have required, then the 900 fee wells assumed to be developed in the next 20 years would result in 324 miles of new road. For the reasons stated above, this is probably an overestimate. Road densities will increase and the increased densities will occur in the area of concentrated development. It is not possible to estimate the degree of increase in any particular locale.

Traffic due to gas development will continue to affect roads in Region 4. On average four drilling rigs will be at work somewhere in the area, each rig requiring an estimated 549 trips at the varying vehicle weights mentioned above.

4.18 Social and Economic

All Alternatives. Employment and Income. The Reasonable Foreseeable Development (RFD) scenario anticipates an average drilling rate of 60 wells per year. This is based on the average level of activity during the last five years. Since the average level of future drilling activity is not expected to change from current levels, future employment in the oil and gas industry in Region 4 would not change substantially. As total gas production grows, some increase in local overhead, production and maintenance staff may be required. To the extent that cyclic ups and downs in drilling activity occur, the number of drilling and completion crews would fluctuate. Changes in numbers of employees in this area would be moderated because a number of the individuals in these areas do not live in Garfield County.

While the stipulations in each alternative may reduce somewhat the number of wells drilled on federal mineral estate, particularly in the NOSR Production Area, it is unlikely that there will be a measurable difference in the total number of people employed in Region 4. Since employment levels are not expected to change greatly, income is also expected to change little. The distribution of employee income between Mesa County and Garfield County may shift more toward Garfield County as the industry becomes more established and more employees choose to live in the area of production.

Government Revenues. Production from 1,200 new wells would be expected to produce over 92 million MCF annually by the year 2018 (COGCC, 1998). The SEIS assumes that 25 percent of the new wells, 300, will be drilled on federal mineral estate and so, production of about 23 million MCF is expected annually from federal wells. At $1.70 per MCF, the estimated wellhead value from federal wells would be about $39 million. That would generate federal royalties (12.5 percent of wellhead value) of $4.9 million annually. Half of that amount would be disbursed to the State of Colorado for distribution according to state law. (Please see Appendix F.)

The reduced production under the alternative considered would also reduce federal royalty payments. Under the Maximum Protection Alternative, royalty payments would be reduced by $326,500 per year. Under the Proposed Action and the Preferred Alternative, federal royalties would be reduced by an estimated $163,250 annually.

Hunting and Fishing Impacts. Impacts to hunting and fishing opportunities and associated revenues resulting from oil and gas development are not measurable given the abundance of factors that contribute towards the land's overall capacity to support wildlife and fish as well as other resources. Refer to Chapter 4, Section 4.11.2.1 for more information on the impacts of oil and gas development on big game hunting and fishing opportunities and associated revenues.

Quality of Life. The impact to the quality of life of residents in the proximity of oil and gas development activities and the degree to which oil and gas development is or is not compatible with residential development is dependent on the perspective of the resident. Generally, some will see oil and gas development as a positive factor in their lives while others will view such activities as negative.

Positive impacts include opportunities for keeping secure and well paid employment, contributing towards economic diversification of local economies, providing greater access to public lands for recreation and other uses, increasing tax revenues, and supplying a needed source of energy.

Negative impacts include an increase in the dust, traffic and noise in certain residential areas at certain times of the year, and an increase in the amount and extent of modifications to the natural landscape which in turn affect the overall landscape character, potentially changing an area from a more natural setting to a more industrial setting.

Lands throughout the GSRA have traditionally provided a mix of agricultural and dispersed residential uses, with relative small communities being established along the major river corridors. Populations continue to grow throughout the GSRA at some of the fastest growth rates in the State of Colorado. In Region 4, mineral development has become a large factor in the overall landscape character since the 1970's. Outside Region 4, development of the ski towns and the associated residential and commercial development has become the primary influence of landscape character.

While perspectives on the impacts of oil and gas development on the quality of life many vary, it is well established that wherever oil and gas development occurs, such development will modify overall landscape character. Equally well established is that other human uses of the landscape will continue as well, especially on private lands; more homes, roads and businesses will be built and more fields and forests will be cleared to provide for such development. The higher the rate of residential and industrial development, the greater the extent of the modification.

Based on the RFD and the current and projected extent of residential development in Region 4, substantial changes to the landscape will continue to occur, affecting the quality of life of affected residents. The nature and extent of that impact is dependent on many factors, especially the perspective of the affected residents, and thus, too complicated for BLM to predict. It is likely that those who view such modifications as positive or neutral will experience positive or negligible impacts to their quality of life. Similarly, those who view landscape modifications, either from oil and gas or other development activities, as negative, will likely experience negative impacts to their quality of life.

Since most of the mineral estate in Region 4 is privately owned, most of the oil and gas activity will continue to occur on private lands. Except in local areas, oil and gas activities on BLM lands will contribute a proportionately smaller share of the resulting changes in the landscape character. In some areas, the influence of BLM activities will be unnoticeable compared to the extent and nature of both the residential and commercial uses of the private lands. In other areas, BLM lands are the primary component of the landscape, though such areas tend to be removed from residential areas.

In areas outside Region 4, factors other than oil and gas development are expected to be the primary modifiers of the landscape character. No impacts to quality of life from oil and gas activity are anticipated. However, in the event oil and gas development were to exceed the RFD, impacts to the quality of life of residents outside Region 4 would be similar to those inside Region 4.

4.19 Areas of Critical Environmental Concern

The Environmental Consequences section for Areas of Critical Environmental Concern is found in the FEIS on pages 4-23 through 4-25. Additional discussion of the impacts of oil and gas development on such areas in the GSRA is included in the sections on Recreation and Visual Resource Management.

4.20 Minerals

This section supplements the discussion of Minerals in the FEIS, Chapter 4, Page 4-25.

4.20.1 Impacts to Date

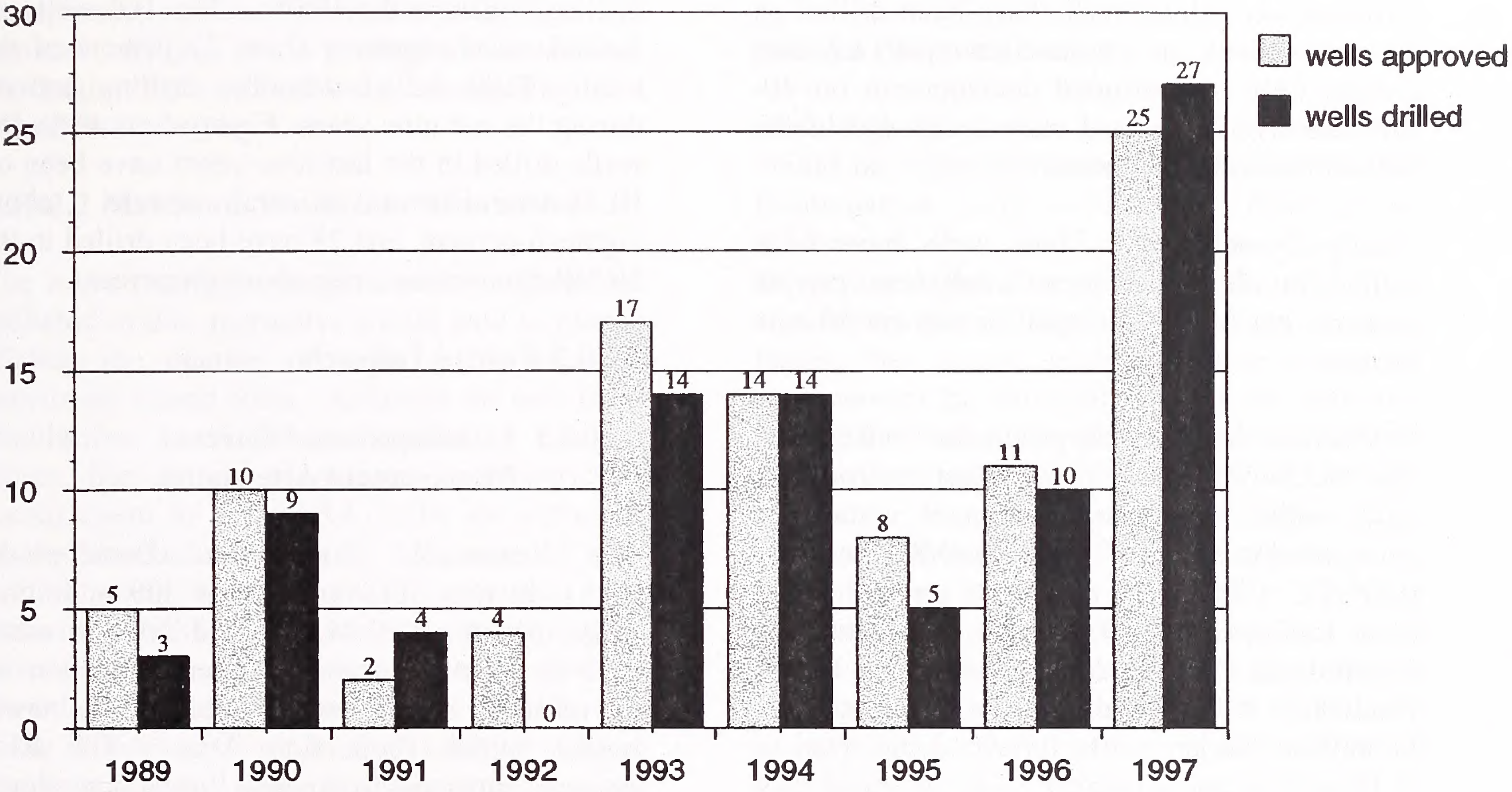
Drilling Activity. Since the 1950's, 130 wells have been drilled on federal leases in Region 4. Of those drilled, sixteen have been plugged and abandoned (P&A) and 114 remain as producing wells as of December 31, 1997. Of those 114 wells, eight are dual locations (a wellpad with two well bores), meaning there are 106 surface locations on federal leases. Forty-eight of the producing wells, about 42 percent, were drilled on split estate (federal minerals, private surface).

Drilling on federal mineral estate from 1957 to 1988 was sporadic, averaging less than two wells per year. Since 1989, activity has increased, averaging about nine wells per year, a total of 84 wells. Graph 4.20-1 displays annual activity on federal mineral estate for the last nine years.

DOE began drilling in the NOSR Production Area in the late 1980's. Thirty wells have been drilled on 24 separate locations (six of the wellpads were dual locations). One of the 30 was P&A, the remaining 29 are producing. Combining the 130 wells drilled on BLM-administered mineral estate with the 30 drilled in the NOSR Production Area, yields a total of 160 wells drilled on federal mineral estate in Region 4 of the GSRA. In general, the analyses of impacts from drilling on federal mineral estate in this document refer to all 160 wells. As necessary, occasional references to 130 wells on BLM-administered mineral estate and 30 wells in the NOSR Production Area may be made.

The number of wells approved and drilled annually on federal mineral estate is depicted on Graph 4.20-1.

Graph 4.20-1 Wells Authorized and Drilled by Year (Federal Wells, Region 4)



Note: Total wells approved = 96. Total wells drilled = 86. Ten approved wells were not constructed and drilled.
Wells may be drilled later than the year in which they were approved

Following is a summary of development by designated gas field.

Grand Valley Field. Federal leases in Parachute Creek, the Grand Valley field, have been developed on 40-acre well density. A pilot program for testing 20-acre density included one well on a federal lease. Subsequently, a small area within the area on private surface and minerals was approved and is being developed on 20-acre well density. Given that development on adjacent properties is occurring on 20-acre density, future development of federal leases on 20-acre density is possible.

Rulison Field. A 40-acre density has concentrated in and around Sharrard Park and Porcupine Creek. Also within the Rulison Field, plans of development are expected for development of the Beaver Creek drainage and the Battlement Mesa/Spruce Creek areas on a 40-acre well densities.

In 1995, BLM approved a plan of development on a 40-acre density in the Garfield County landfill which will continue to be the plan for future development there. The landfill was patented to Garfield County in 1997 under the Recreation and Public Purposes Act; however, oil and gas mineral rights are held and managed by the federal government. Additional drilling to fill in 40-acre density would continue according to the plan. A pilot program for developing 20-acre density was also approved by COGCC in 1996 for the landfill area. Two directional wells into federal minerals under the operating landfill were part of this pilot. Since the pilot program, an adjacent area has been approved and is being developed on 20-acre density.

Mamm Creek Field. The majority of the Mamm Creek Field is fee mineral estate; however, six federal wells have been drilled on 40-acre density in conjunction with adjacent private wells. Continued development on 40-acre density is expected with a majority of the federal wells on split estate.

Divide Creek Field. Three wells have been drilled on federal leases. Adjacent private property has been developed in part on 40-acre density.

Production. In 1996, gas production in Region 4 was 36,254,760 MCF. The production from 300 new wells on federal mineral estate is anticipated to be about 23 million MCF annually (COGCC, 1998). This represents somewhat less than four percent of all gas production in Colorado in 1996. Production from the NOSR Production Area would be expected to be about 5.4 million MCF.

Table 4.20-1
Wells Drilled In Region 4, 1989-97

Year	Wells Drilled			
	Total	BLM	DOE	All Fed.
1989	33	3	8	12
1990	88	8	2	10
1991	15	4	0	4
1992	12	0	4	4
1993	41	13	5	18
1994	81	14	5	19
1995	46	4	4	8
1996	53	10	0	10
1997	88	27	0	27
Total 1989-97	457	84	28	102
Average 1989-97	51	9	3	11
Total 1993-97	309	68	14	82
Average 1993-97	62	14	3	16

Cumulative impacts to date. Drilling. 700 wells have been drilled in Region 4 since drilling began in the 1950's. The 160 wells on federal estate represent about 23 percent of the total. Table 4.20-1 describes drilling activity during the last nine years. Eighty-four of the457 wells drilled in the last nine years have been on BLM-administered mineral estate, about eighteen percent, and 28 have been drilled in the NOSR Production Area, about six percent.

4.20.2 Future Impacts

4.20.2.1 Continuation of Current Management Alternative

The Reasonable Foreseeable Development (RFD) in this SEIS anticipates 300 additional wells drilled on BLM-managed mineral estate over the next 20 years (Chapter 4, Section 4). 70 of these are assumed to be in the newly leased NOSR Production Area. The RFD assumes most environmental protection would occur under the authority of the standard lease terms, except in the NOSR Production Area where the existing stipulations would apply to new leases.

Production from the 300 new federal wells in the year 2018 could be about 23 million MCF per year. The RFD for portions of the GSRA outside of Region 4 remains as specified in the FEIS at eighteen wells over 20 years. Little production is anticipated outside of Region 4.

Development on private lands will continue on 40-acre spacing and more 20-acre trials and downsizing could be expected. New COGCC cause orders for increased densities would not directly result in the same density on BLM. Densities greater than 40 acres would be reviewed on a case-by-case or in a Plan of Development to determine the impacts and to examine the potential for limiting surface disturbance to existing 40-acre locations. Future drilling proposals based on 20-acre spacing could be limited to existing 40-acre locations with additional well bores drilled from existing wellpads. Exceptions could be granted based on NEPA review of the impacts, the amount of new disturbance, cumulative impacts in the area and unusual drilling and geological conditions. Production from federal wells outside Region 4 would likely be very low.

4.20.2.2 Maximum Protection Alternative

The more restrictive environmental stipulations included in this alternative would tend to reduce slightly the number of wells drilled even in previously leased areas. Although the new lease stipulations could not be applied to existing leases, they would encourage more restrictive management by the GSRA under the authority of the standard lease terms. Because of this, drilling costs would increase somewhat. In particular, NSO stipulations to protect highly erosive soils, steep slopes, and sensitive viewsheds and to maintain well site stability will make it more difficult to find suitable wellpad locations and will make their construction more costly. Additionally, more directional wells would be drilled from dual locations, increasing the cost of drilling but also reducing the amount of surface disturbance. Increased costs to directional drill are estimated at approximately $150,000 per well, decreased somewhat by lower construction and reclamation costs if an existing wellpad is used. Under this alternative, drilling in portions of the GSRA outside of Region 4 would remain as specified in the FEIS at eighteen wells over 20 years.

In the NOSR Production Area, a decline from 70 wells to 55 would be possible as site stability, steep slope and visual constraints would result in some locations being unacceptable and thus being denied by BLM. While the number of locations would likely decrease in the NOSR Production Area, the number of wells would not decrease as much, as more directional wells would be drilled. If the number of wells on existing leases and on new lease in the NOSR Production Area were reduced by 20 overall, annual gas production would be reduced by about 1.5 million MCF, about a seven percent reduction, and access to an estimated 30 BCF of federal gas reserves would be lost or postponed.

4.20.2.3 Proposed Action

Stipulated protections under this alternative would be more restrictive than those under the Continuation of Current Management Alternative but less than the Maximum Protection Alternative. Although the new lease stipulations could not be applied to existing leases, they would encourage more restrictive management by the GSRA under the authority of the standard lease terms. Because of this, drilling costs would increase somewhat although not to the degree created by the Maximum Protection Alternative. The NSO stipulation on steep slopes in this alternative permits exceptions for short stretches of road or small portions of a wellpad. This change may affect a very few proposed well locations but is unlikely to have much overall effect on the number of well locations as 35 percent slope is thought to be an engineering limitation.

The change from NSO to CSU for the Site Stability stipulation will make placement of wellpads somewhat less difficult. The limitation of the sensitive visual NSO stipulation to the I-70 viewshed (rather than five Region 4 viewsheds) will also make placement of wellpads somewhat easier. All told, it is assumed that the restrictions under this alternative will reduce the number of wells in the NOSR Production Area from 70 under the Continuation of Current Management Alternative to 65, and from 300 on all federal mineral estate to 290. The consequent loss of annual production could be about .8 million MCF. Access to perhaps fifteen BCF of gas reserves would be lost or postponed. Under this alternative, drilling in portions of the GSRA outside of Region 4 would remain as specified in the FEIS at eighteen wells over 20 years.

4.20.2.4 Preferred Alternative

The Preferred Alternative is similar to the Proposed Action in most of those elements that might affect the number of wells drilled. The NSO on steep slopes has been redefined from slopes over 35 percent to those over 50 percent, while the CSU on slopes in excess of 25 percent has been changed to a CSU on slopes from 30 to 50 percent. Within Region 4, these changes would be expected to come into play in the NOSR Production Area. The changes were made to make management of development on steep slopes more flexible, and based on site-specific factors. It is possible that some increase in overall well numbers might occur due to the change in the slope stipulations during the next 20 years. Well numbers and production are thus expected to be slightly higher the same under the Preferred Alternative as under the Proposes Action in Region 4. However, since the magnitude of the change is not known, BLM did not change the number of wells for the Preferred Alternative. Outside Region 4, the differences between the Proposed Action and the Preferred Alternative are not expected to alter the assumption of the FEIS, eighteen wells over 20 years.

4.20.3 Cumulative Impacts

The RFD anticipates 1,200 additional wells drilled on all mineral estate over the next 20 years. Production from these new wells in the year 2018 could be as much as 1,274 million MCF.

4.21 Environmental Consequences of Managing Oil and Gas Operations under Existing Leases

Introduction

The impacts associated with the Standard Lease Terms and Conditions Alternative were discussed in the FEIS, Chapter 4. Since the Draft SEIS was a supplement to the FEIS, this alternative was not reconsidered in the Draft. However, as stated in the Draft SEIS, page 1-2, all portions of the FEIS are incorporated into the Draft SEIS unless modified or replaced by the Draft SEIS. Therefore, all information in the FEIS concerning the Standards Lease Terms and Conditions Alternative remains unchanged and is incorporated into the Draft SEIS.

Some reviewers of the Draft SEIS suggested that since most of Region 4 was already leased prior to the FEIS, that actual operations under the existing leases was therefore more like the Standard Lease Terms and Conditions Alternative described in the FEIS than the Continuation of Current Management Alternative described in the SEIS. This statement is based on the premise that since lease rights constrains BLM's ability to apply the restriction contained in the FEIS, then BLM would be unable to require most of the measure described in the FEIS. However, BLM has reviewed the implementation status of each of the stipulations contained in the FEIS. A summary of this review was added into the Final SEIS, Chapter 2, Section 2.3. That review concludes that many measures have been implemented to achieve the objectiveds of the stipulations included in the FEIS have been implemented, at least in part, consistent with the FEIS.

The Draft SEIS evaluated the impacts to date of oil and gas activity. Since most all the impacts to date on BLM lands have occurred from activities on existing leases, and since nearly all of the stipulations included in the FEIS have been implemented on existing leases, at least in part, the Impacts to Date sections in Chapter 4 of the Draft SEIS provides a reasonable evaluation of the impacts associated with the Standard Lease Terms and Conditions Alternative.

Refer to Chapter 4 of the FEIS for a description of the impacts from oil and gas operations conducted under the Standard Lease Terms and Conditions Alternative. Some sections are highlighted here.

Wildlife

As stated in the FEIS, standard lease terms would not allow BLM to mitigate all of the most detrimental impacts to crucial fish and wildlife habitat form oil and gas development, including: 1) disturbance to big game birthing habitat and crucial winter range habitat; 2) new road construction into unroaded or isolated areas; 3) disturbance to sage grouse leks; 4) disturbance to nesting raptors, waterfowl and great blue heron; 5) impacts to riparian/wetlands.

New road construction into unroaded or isolated areas would cause loss of escape cover and result in increased legal and illegal harvest of big game animals. Oil and gas development within crucial winter range could result in both loss of habitat and displacement of animals. The cumulative impacts of this action in conjunction with other unrelated activities could have locally significant impacts.

Field development could result in substantial loss of habitat and disturbance would occur during the critical winter period, resulting in shifting wildlife to other lands, significant loss of newborn animals, significant reductions in raptor production and populations.

The FEIS more strongly made the case that oil and gas development in smaller, more concentrated areas would result in substantial losses of habitat at the local level since evaluating impacts at the regional level tended to discount the more local impacts. This "underestimation" of wildlife impacts at the local level has been identified as a concern by the Colorado Division of Wildlife.

In conclusion, according to the FEIS, if none of the measures described in the Proposed Action Alternative were implemented, then the Standard Terms and Conditions Alternative could lead to significant, unavoidable adverse impacts to wildlife. However, as previously stated, BLM and the operator have successfully applied, measures to achieve described in the FEIS. Additional measures prescribed in the SEIS should further reduce the impacts associated with oil and gas operations conducted on existing leases.

Soils

The FEIS concludes for the Standard Lease Terms and Conditions Alternative that, especially in field production areas, high erosion would occur on fragile soil areas, leading to an increase in sedimentation and siltation and a significant loss of soil and an overall loss of long-term site productivity.

The Draft SEIS acknowledges impacts to soils and site productivity, especially in the short term, but concludes the overall increased sedimentation that would result would be minimal compared to natural erosion rates. The Draft SEIS proposes additional measures to reduce the local, site-specific impacts and suggests that mitigation measures adopted by the BLM to reduce soil impacts have been and can continue to be reasonably effective.

Visual

The FEIS states that oil and gas exploration and development could have adverse effects on visual resources, with long-term and significant impacts to some visual values in full field development areas.

The Draft SEIS supports these conclusions and has developed additional protective measures to help reduce overall visual impacts.

Minerals

The FEIS, as well as the Draft SEIS, acknowledges that any form of leasing restrictions or discretionary mitigation would have an adverse impact on oil and gas drilling operations, increasing drilling costs and in some case hindering or preventing oil and gas operations.

Summary

The FEIS concluded that environmental impacts from conducting oil and gas operations under leases which include only Standard Terms and Conditions would be equal to or greater than impacts from any of the other more restrictive alternatives. In the case of wildlife, soil and visual resources, significant, long term impacts could result. As described in the Draft SEIS, more than 95 percent of Region 4 has already been leased. Therefore, oil and gas operations have been and will continue to be mostly conducted according to the Standard Lease Terms and Conditions. However, as previously stated, BLM and the operator have successfully applied, measures to achieve many of the objectives described in the FEIS. BLM also expects to be able to apply much of the new protective measures described in the Preferred Alternative. Thus, the impacts asociated with oil and gas operations conducted or existing leases should be further reduced..

Nonetheless, though BLM will continue to take reasonable measures to mitigate impacts from operations conducted on existing leases, some future wells will be approved in locations, or during certain times of the year, that might not have been approved under the Preferred Alternative. Therefore, because of existing leases, the environmental consequences section described in the FEIS for the Standard Lease Terms and Conditions Alternative may be the more likely assessment of environmental impacts associated with oil and gas development in certain local areas of (impact zones) Region 4. Refer to the Draft SEIS, Appendix G, for a description of the impact zones.

Chapter Five

CONSULTATION , COORDINATION AND PUBLIC PARTICIPATION

5.1 Consultation and Coordination

The Bureau of Land Management (BLM) in its Glenwood Springs Resource Area, Grand Junction District and Colorado State Offices has an ongoing working relationship with the U.S. Forest Service, the Colorado Oil and Gas Conservation Commission (COGCC) and the Colorado Division of Wildlife (CDOW). That working relationship has continued throughout the development of this document. Garfield County participated in identifying issues and potential solutions. Consultation with the U.S. Fish and Wildlife Service on threatened and endangered species was initiated during the FEIS, continued through this process, and will continue throughout oil and gas development in Region 4. As described in Chapter 1, the GSRA had numerous and frequent interactions with residents of the area, and with several organized groups, in particular the Battlement Mesa Service Association and the Grand Valley Citizens' Alliance. Section 5.3 summarizes the SEIS public participation process.

5.2 List of Preparers

This SEIS was produced by the following BLM specialists, listed by title, office and area of responsibility. Office acronyms are described below.

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Jeanette Pranzo	Economist	CSO	Socioeconomic Impacts
Joanne Sanfilippo	Archaeologist	GSRA	Cultural, Paleontology
Jim Scheidt	Hydrologist	GJDO	Soils, Surface Water

Mary Beth Stulz	GIS Specialist	NARSC	GIS Support, Training
Jim Wilkinson	Geologist	GSRA	Groundwater
Kermit Witherbee	Geologist	CSO	Leasing, Project Rulison

This document was assembled and formatted by The WordSmith (A/K/A Linda Schuemaker). The WordSmith provides writing, editing and graphic design services in the Glenwood Springs area.

CSO -- Colorado State Office
GJDO -- Grand Junction District Office
GJRA -- Grand Junction Resource Area
GSRA -- Glenwood Springs Resource Area
NARSC -- National Applied Resources Science Center

5.3 Public Participation

The Supplemental Environmental Impact Statement (SEIS) on oil and gas leasing in the GSRA was initiated on April 21, 1997, with the publication in the Federal Register of a Notice of Intent (NOI) to amend the Resource Management Plan. The NOI began a formal 30-day public scoping period. At the same time the notice was published, a press release to most western Colorado media and a mailing to approximately 350 organizations and individuals announced BLM's intention to amend the RMP on oil and gas leasing and solicited public response on issues of concern. Response to these scoping announcements was very limited. However, a July 9 public meeting sponsored by the COGCC in Battlement Mesa in which BLM participated drew over 300 participants and provided much information on issues important to area residents.

COGCC held a subsequent public forum in Rifle, Colorado, on February 19, 1998. At issue was a COGCC proposed rulemaking on public participation in the decisionmaking process. BLM was an observer and the strong public attendance provided further insight into local attitudes toward oil and gas development and issues of concern to oil and gas operators, employees and subcontractors.

During the development of the SEIS, BLM acquired management responsibility for the Naval Oil Shale Reserves (NOSR), a 56,000 acre tract of public land outside of Rifle, and was directed to lease a portion of the NOSR that had already been partially developed for oil and gas. On March 17, 1998, BLM published an NOI to include that portion of the NOSR in the SEIS. Another 30-day scoping period was initiated which again received limited response.

The Draft SEIS was released on June 19, 1998, and a 90-day review period was begun. On July 7, a public workshop on the SEIS was held in the Parachute Senior Citizens Center from 3:00 p.m. to 8:00 p.m. About 20 members of the public attended. Just before the end of the review period, residents outside Region 4, the area of oil and gas development, became aware of the potential significance of several oil and gas leasing decisions for recreation management in Eagle County. At the request of a number of Eagle County residents, the Draft SEIS review period was extended to November 23 to allow more time for review and comment, especially by members of the public concerned with issues outside Region 4. The GSRA took advantage of the extension to release an Addendum to the Draft SEIS which corrected several errors in the Draft and also provided a more extensive analysis of the impacts on air quality.

5.4 Comments and Responses

Over 500 comment letters, cards and public meeting response forms were received by BLM during the review and comment period. Over 300 of these were copies of four form letters with individual signatures. Because of the extension of the review period, a number of reviewers responded twice, once before the end of the initial review period and again during the extension. The volume of the comments and the similarity of many of the comment letters makes it impossible to reprint all of the comment letters. However, as required, all comment letters received from government agencies have been reproduced in a companion document, ***Comment Letters***. Letters from associations, organizations and corporations engaged in oil and gas development in the GSRA have also been reproduced. In addition, a number of representative letters from individuals were reproduced, including samples of the form letters.

All of the comments were read by BLM specialists and evaluated for content. Individual comments were distilled from the comment letters and organized according to category, for example, Air Quality, Reclamation, Wildlife. Each comment within a category was then assigned a category number, as in AQ1 for the first air quality comment, and RL10 for the 10th reclamation comment. Table 5.4-1, Comment Index, contains a complete listing of all those reviewers who sent in comments and the individual comments contained in their comment letters. The four names followed by *et al* were those selected as representative of the individuals who sent in form letters.

The individual comments are organized into eighteen categories. They are:

1. Air Quality (AQ) - air quality impacts;
2. General (GN) - miscellaneous comments or those of a general nature;
3. Leasing Policy and Practice (LP) - BLM's leasing policy and its management of leases;
4. Lease Rights (LR) - the rights of oil and gas lessees and BLM management authority;
5. NEPA Process (NP) - the SEIS and the NEPA process;
6. Operations Management (OM) - BLM's management of drilling proposals;
7. Reasonable Foreseeable Development (RD) – the number of wells used in the impact analysis;
8. Reclamation (RL) - reclaiming oil and gas wellpads and roads;
9. Recreation/Wilderness (RC) - management of recreation and wilderness resources;
10. Riparian (RP) - function of riparian and wetland zones;
11. Socioeconomic (SE) - employment, income, revenue and quality of life;
12. Soils (SL) - issues of slope stability and erosion;
13. Special Status Species (SS) - threatened, endangered and sensitive plant and animal species;
14. Transportation (TN) - roads and their impact;
15. Visual Resource Management (VR) - impacts on visual quality;
16. Water (WT) - surface and groundwater issues;
17. Wildlife(WL) - all creatures great and small; and
18. Public Meeting (PM) – designates an attendee at one of the two BLM public meetings.

Table 5.4-1 Comment Index

GOVERNMENT	
Colorado Dept. of Public Health and Environment	AQ1, AQ8, AQ9, AQ10, AQ11, AQ12, AQ65, AQ66, AQ67, AQ68, AQ69, AQ70
Colorado Division of Wildlife	GN1, LP2, LR2, LR3, LR4, NP6, RL2, SL1
Colorado Oil & Gas Conservation Commission	RD4, SL2
Garfield County	GN1, OM1, VR4
US Dept. of Energy, NPOSR	NP3, RD2, RD3
US Environmental Protection Agency	AQ31, AQ32, AQ33, AQ34, AQ35, AQ36, AQ37, AQ38, AQ39
US Forest Service	AQ27, AQ28, AQ29, AQ30, GN10
ORGANIZATIONS/CORPORATIONS	
Aspen Wilderness Workshop	AQ13, AQ14, AQ15, AQ16, AQ17, GN1, LP5, LP9, NP13, OM2, OM4, OM6, RC5, RD9, RL1, TN1, WL6
Barrett Resources Corp.	AQ18, AQ19, AQ40, AQ41, AQ42, AQ43, AQ44, AQ45, AQ46, GN2, GN3, LR5, LR6, NP12, NP16, NP17, OM2, OM10, RD10, RP5, SE5, SE6, SE7, SL5, SL6, VR5, WL10, WL13, WL14, WL15
Battlement Mesa Service Association	OM9, VR8
Colorado Environmental Coalition	GN1, GN16, LP2, LP5, NP1, NP18, OM2, RC2, RC11, RC12, RP6, SS4, SS5
Colorado Oil and Gas Association	GN11, SE4
Eagle County Back Country Trails Subcommittee	NP4, NP5
Grand Valley Citizens Alliance	AQ20, AQ21, AQ22, AQ23, AQ24, AQ25, AQ26, AQ55, GN1, GN13, LP9, LR4, NP6, NP15, OM2, OM3, OM6, RC11, RD5, RL2, RL5, RL6, RP2, WL11, WT3
IPAMS	GN2, SE5

ORGANIZATIONS/CORPORATIONS	
RMOGA	GN2, GN14, GN15, SL4, VR9, WL12
San Juan Citizens Alliance	LP2, LP9, OM2, RD5, RL1, RP2
Snyder Oil Corporation	GN2, RC10, RP4, SS6, VR6, WL10
Tom Brown, Inc.	AQ60, AQ61, AQ62, AQ63, AQ64, GN2, GN12, GN13, NP14, RP4, SE5, SE6, TN2, WL7, WL8
Upper Arkansas & So. Platte Project	GN1, LP9, OM2, RD5, RL2, RP2
Western Slope Environmental Resource Council	GN1, OM2
Wildlife Management Institute	GN1, WL9

INDIVIDUALS	
Joe Abbott	LP2, NP4
Cindi Ackerman-Castro, et al	GN2
James J. Adkins	PM
Bill Andree	NP4, NP5
Robert L. Arnold	RC1, LP2, NP4, NP5, PM, GN1, NP8
John Bailey	PM
E. Bailey, III, et al	GN2
Emily B. Baker	GN1, LP1
Patsy Batchelder	NP4, NP5
Charlotte Baugh, etal	GN2, NP12, GN11
Sarah S. Bedford	GN1
Bruce Berger	LP2, RD1
Martha Berry	PM
Kaycee Binger	WT1, LP1, RL1, GN1

INDIVIDUALS	
Kathy Bright	GN1
John Broderick	LP8, LR1, LR2, LR3, NP6, RL2, SE3, SL1, WL1, WL2, WL4, WL5
Roger C. Brown	NP4, NP5
T.J. Brown	PM, LP2
Edna Burkey, et al	NP12, GN2
Joe and Debra Burleigh	GN1
Edwin J. Callaway, Jr.	GN1
Janice Caro	GN1
Janet Cino	LP1, OM2, RL2, RL1
Norm Clasen	LP1
Aaron Cloninger	GN1
Elaine Cloninger	LP2, VR1, GN1, PM
Ron Cloninger	AQ1, AQ3, AQ4, AQ5, AQ6, VR2, GN1
Colorado Eagle Ranch	AQ47, AQ48, AQ49, AQ50, AQ51, AQ52, AQ53, AQ54, AQ56, AQ57, AQ58, AQ59, GN5, GN7, GN8, GN9, LP2, NP4, NP5, NP8, NP9, NP10, NP11, RC8, RD8, RL4, SE2, SL1, SS2, SS3, VR7
Shawn Considine	GN1
Edward Cooley	PM
Cordillera	NP4, NP5
Bob Cunningham	PM
Anna May Daly	GN1, OM2
Sharon Daniel	OM2, GN1
Donald Davis	WL3
Richard Dixon	PM
Brian A. Donaldson	NP4, NP5

INDIVIDUALS	
Diana Donovan	LP2
V. Starr Edinger	GN1, VR3
Annie Egan	GN1, OM2, NP4, NP5
Constance Erhard	GN1, OM2, LP2, SE1
Anne Esson	LP2
Clark Ewing	RC2, LP4, LP2, PM
Welton Francis	PM
Carol Frederick	GN1, RP2, RL1, RL2
Bruce Gabow	LP1
Richard Galloway	NP4, NP5, PM
Selene Gamez	GN1
Mrs. M. Goldhardt	PM
Debra Lynn Gore	GN1, OM2, RD5, RL2
Paul Gotthelf	GN1, NP4, NP5
Harold F. Graves	GN1, LP1
Marilyn E. Graves	GN1, LP1
Larry Gulley	LP2, GN1, PM
Lisa C. Hammond	GN1
Randy Harmon	GN1
Merrill G. Hastings	NP4, NP5, PM, GN1, RC1
Kathy Heicher	NP4
Brad Hendricks	GN1, RD5, RL2
Jane Hines	LR1, LR3, LR4, NP7, OM6, RD5, RL2, RL3, RL5, RP1, SL1
John Hoffman	GN1

INDIVIDUALS	
Gary & Sherry Hoof	RL1, LP1, GN4, RD4, OM5
Mrs. Rebecca Horst	NP4, NP5, LP2
Renee & Travis Horton	GN1
Ralph G. Irwin	GN1, RD4
Terry Ivie	PM
Peter A. Jaffee	NP4, RC4, GN1, PM
Peter Jamar	NP4, NP5
Donna Kennedy	NP4, NP5
Fred "Skip" Kinsley, Jr.	RD6
Charles H. Kissinger	LP7
Pete Kolbenschlag	PM
A. Lawrence Kolz	OM2
Judy R. Kolz	OM2
Margarete Kresz	GN1, OM2
Karen K. Lacey	RD4, RP2
James Langstaff	RL3, RD4, RL1
Merv Lapin	NP4, RC4, PM, GN1, RC2, RC1
Helen Leyba	GN1
Vanni Lowdenslager	GN1
Harold L. & Anne M. Madeen	RL3
Carol Mathias	RL3
Doug & Jenny Maxfield	NP4, NP5
Marian F. McAleenan	GN1, OM2, LP2
Eileen & Andrew McGregor	GN1

INDIVIDUALS	
Chester McQueary	LP1, OM2, LR1, GN1, OM6
Iris Meachum	GN1
Deb Meader	AQ1, LP1, RP2, OM2, RL2, RL3, RD5, OM6, GN4, SE3, VR3, AQ
Paula Mecham	GN1
Clement F. Meyer	GN2
Ron Mitchell	GN1, OM2, LP2, LP1, RD4, RL2
Larry Moyer	LP7, RC5, RL6
Nancy J. Mueller	GN1
Norman J. Mullen	LP2, RL3, PM
Deborah Murphy and Family	LP1
Ken Neubecker	LP2, RC5, RD7, SL3, SS1
Mike Pace	NP4
Gene Park	GN1, RL3, OM3, OM4, PM
James & Hensley Peterson	GN1, OM2, AQ?
Dianne M. Plunkett	GN1, LP2
Eric Rechel	GN1, OM2
Carl & Cindy Roberts	GN1, RD5, RD4, OM2, SE3
Joan L. Savage	AQ1, AQ2, AQ4, PM, RD5, RL1
Bill Schapley	GN1, OM2, RD4
Auden Schendler	GN1
Babs Schmerler	GN1, LP1, OM2, RD4
Evelyn R. Scott	GN1
Rosie Shearwood	GN1, LP2, PM, RC9
Suzanne S. Shephard	NP4, NP5
Kim Stacey	GN1
Jon Stavney	PM

INDIVIDUALS	
Thomas & Florence Steinberg	GN1, PM
Eleanor Steinle	GN1
Richard & Helen Stenmark	PM
Henri Stone	GN1, PM
Tom Stone	PM
Valerie Stone	GN1, OM2
Hal Sundin	GN1
Cynthia K. Swanson	GN1, LP1, RD4
Margaret Taylor	GN1
Jim Thayer	LP3
Jeanette & David Truog	RL3
Brad Udall	NP4, NP5
Amy Vespa	GN1
Sheri Weiland	GN1
Betty Weiss	GN1, OM2
Shelly Weiss	LP1, RL2
Wayne E. Wells	LP6, OM7, OM8
H. Lynn Whitney	GN1, RD4, VR3
Jacque Whitsitt	GN1, LP2
Andy Wiessner	LP2, GN1, LP5, RC7
Shirley Willis	GN1, OM2, WT2, PM
Scott Winnegrad	NP4, NP5
Tony Zurcher	LP2

Air Quality (AQ)

AQ1 *Air quality should have been more thoroughly addressed in the Draft SEIS. Scientifically acceptable and accurate measures of air quality are needed.*

Response: The Draft SEIS addressed potential air quality impacts based upon those issues identified to be of concern through the original scoping process. This process (described in detail at 40 CFR 1501.7) is used to determine the scope of issues to be addressed, and for identifying the significant issues related to a proposed action. Based on this scoping, the original Draft SEIS focused its analysis on the air quality-related issues identified to be of concern (specifically, potential local air quality impacts due to well pit flaring).

During the original Draft SEIS review period, BLM completed an additional analysis of the potential air quality impacts that made use of computerized modeling of emissions from potential oil and gas development activities and the dispersion of those emissions in the near-field and far-field. This analysis was presented in the SEIS Addendum dated June 1998, and replaced Sections 3.2 and 4.2 of the Draft SEIS. The comment period was extended through November 23, 1998, in order to allow an adequate opportunity for review of the Addendum.

As stated in the Draft SEIS Addendum: "No significant, adverse impacts to air quality are anticipated from implementation of the Proposed Action or Alternatives." Based on separate assessments predicting potential near- and far-field air quality impacts (Notar 1998 and Vimont 1998), localized short-term increases in particulate matter, carbon monoxide, nitrogen dioxide, ozone, and sulfur dioxide concentrations would occur, but maximum concentrations would be well below applicable ambient air quality standards. Similarly, hazardous air pollutant concentrations would be below states' Acceptable Ambient Concentration Levels (AACC), and the related short- and long-term cancer risks (to well rig operators and nearby residences) would be below significance levels. The basis for this conclusion are detailed in the technical reference documents, which are available to any interested individual for independent review.

AQ2 *Affects to Air Quality and Environmental Consequences are incomplete.*

Response: Please see Response AQ1.

AQ3 *The report fails to connect the interdependence of viewscape quality and air quality maintenance. Viewscapes worthy of analysis are also deserving of Prevention of Significant Deterioration (PSD) Class I air quality designation if the views in question are 'foreground' and 'middle ground' zones.*

Response: In 1977, the United States Congress designated the Eagles Nest, Flat Tops, Maroon Bells-Snowmass, and West Elk wilderness areas as mandatory Prevention of Significant Deterioration Class I Areas. Under Section 169 of the Clean Air Act, Congress further required that "significant progress" be made in order to remedy any existing, and prevent any future, man-made visibility impairment within these mandatory PSD Class I areas. Although the State of Colorado could redesignate other areas as PSD Class I, only the mandatory PSD Class I areas identified by Congress would be subject to the Section 169 visibility protection requirements.

In addition, as reported in the Draft SEIS Addendum, a visibility impact screening level analysis predicted that the Proposed Action or Alternatives would not result in a perceptible (1.0 deciview reduction) visibility impact at any of the PSD Class I areas.

AQ4 *The report fails to account for many gas well production activities that bear directly on air quality. Each well is assumed in the report to have one drilling and flaring event. In actual practice, wells within this area are commonly 're-completed' to greater depths with requisite occupancy of the pad as in the first drilling and flaring.*

Response: As reported in the Draft SEIS Addendum, at the proposed level of well field development, seldom more than four wells throughout the project area, and rarely more than two wells in close proximity, would be flared at any one time. The analysis further concluded that all predicted completion testing air quality impacts would be less than the applicable Colorado and National Ambient Air Quality Standards. These assumptions and conclusions would also be applicable to any "re-completion" of previously drilled well sites.

AQ5 *An ugly face of gas production activity is the post-production release of gaseous toxic sulfur compounds. Natural gas when depleted is commonly followed by release of hydrogen sulfide and other gases that destroy surrounding vegetation and pose a human health risk to anyone that happens to be nearby. Remote monitoring of wells can also* *lead to remotely initiated releases of such fugitive gases. In such instances, persons or animals downwind, without warning, will be gassed.*

Response: Natural gas located in the study area does not contain sulfur compounds, and ambient concentrations of released air pollutants would be below the applicable air quality standards. Therefore, as stated in the Draft SEIS Addendum: "No significant, adverse impacts to air quality are anticipated from implementation of the Proposed Action or Alternatives."

AQ6 *Join us in promoting the Rulison area as a PSD Class I air quality area.*

Response: Most of the analysis area is currently designated as PSD Class II, where moderate increases in specific air pollutants above an established "baseline" level are allowed. These PSD Class I and II increments are not likely to be exceeded, but as stated in the Draft SEIS Addendum, "NEPA analysis comparison to the PSD [increments] is intended to evaluate a 'threshold of concern,' and does not represent a regulatory 'PSD Increment Consumption Analysis.'" The State of Colorado, Department of Public Health and Environment, Air Pollution Control Division (CDPHE-APCD) is responsible for implementing the PSD program in the analysis area (including any potential re-designation of areas from Class II to Class I), under their Environmental Protection Agency (EPA) approved State Implementation Plan.

AQ7 *The National Environmental Policy Act (NEPA) requires that environmental impact statements clearly disclose the environmental impacts of the proposed action. In addition, the Supreme Court in Baltimore Gas and Electric Company vs. The Natural Resources Defense Council, Inc., 462 U.S. 87, 97 (1983) indicated NEPA places "... upon an agency the obligation to consider every significant aspect of the environmental impact of a proposed action."*

Response: Please see Response AQ1.

AQ8 *While it is true that the State of Colorado, Department of Public Health and Environment, Air Pollution Control Division (CDPHE-APCD) will consider facility-specific impacts in the permitting process and to some extent project-specific impacts in the permitting and PSD increment tracking processes, it is not necessarily true that the CDPHE-APCD will estimate the impacts of the GSRA project as a whole. The impacts of the project as a whole need to be addressed in the SEIS.*

Response: The SEIS has been prepared to address potential oil and gas leasing on BLM-administered lands within the GSRA, and is not a "project-specific" assessment. However, in order to analyze and disclose potential air quality-related impacts from such leasing, the SEIS Addendum did examine potential direct and cumulative air quality impacts based on "reasonable, but conservative" analysis assumptions. As stated in the Draft SEIS Addendum, no significant, adverse impacts to air quality are anticipated from implementation of the Proposed Action or Alternatives.

The Draft SEIS Addendum also stated "air pollution impacts are limited by state and Federal regulations, standards, and implementation plans established under the Clean Air Act and administered by CDPHE-APCD. Colorado regulations require proposed air pollutant emission sources undergo a permitting review, including dehydrators, separators, and gas compressors. Therefore, CDPHE-APCD has the authority to review emission permit applications and to require emission permits, fees and control devices prior to construction and/or operation." In addition, the United States Congress (through the Clean Air Act Section 116) authorized local, state and tribal air quality regulatory agencies to establish air pollution control requirements more (but not less) stringent than Federal requirements. The CDPHE-APCD is the primary air quality regulatory agency responsible (subject to EPA review) for implementing these air quality regulations.

AQ9 *On page 4-2, an analysis of a similar proposed natural gas development in Wyoming is referenced in support of statements made in the GSRA SEIS. There is no way for the reader to assess the similarity of these two projects in terms of scope, size and geography.*

Response: Please see Response AQ1.

AQ10 *Tables containing emissions estimates for elements of the project (e.g., completion testing at a single well, unit well construction, and unit compressor activity) and for the project as a whole should be included in the text or an appendix. These should be summarized in the Chapter 4 narrative on air quality.*

Response: Please see Response AQ1. In addition, detailed descriptions of the emission levels assumed in the air quality impact assessment are provided in the near- and far-field technical support documents (Notar 1998 and Vimont 1998).

AQ11 ***It is our understanding that the results of ISC3 modeling or near-field air quality impacts and CALPUFF modeling of far-field impacts are going to be included in the final SEIS. Since these analyses are not present in the Draft SEIS, it is not possible for the Division to assess the adequacy of the air quality modeling of this natural gas development project. Inclusion of appropriate modeling results, however, would greatly improve the completeness of the SEIS. Model results should address potential impacts to visibility along the I-70 corridor as well as in nearby Class I areas.***

Response: Please see Response AQ1. In addition, since current visibility regulations apply only in mandatory PSD Class I areas, the visibility impact assessment focused on the Eagles Nest, Flat Tops, Maroon Bells-Snowmass and West Elk wilderness areas, although potential visibility impacts at the PSD Class II Holy Cross and Raggeds wilderness areas would be less than those predicted in the PSD Class I Flat Tops wilderness area.

The far-field CALMET/CALPUFF analysis (Vimont 1998) did analyze maximum potential 24-hour average total light extinction impacts (reported as the 1st through 4th highest values) at each location throughout the modeling domain. The range of values was: No Action/ Continuation of Current Management (7.6 to 5 Mm^{-1}), Reasonably Foreseeable/Proposed Action (15 to 9.5 Mm^{-1}), and the Sodium Plant/Other Cumulative Sources (1.1 to 0.6 Mm^{-1}). Although these predicted impacts are not necessarily paired in time and location, it is possible total light extinction could be doubled* for a few days each year, in a localized area along the I-70 corridor.

Without specifying view characteristics within the I-70 corridor, it is not possible to quantify the potential visibility impacts. However, given the high background visibility conditions, short sight paths, and colored background cliffs, it is not likely that significant, adverse visibility impacts would occur along the I-70 corridor from implementation of the Proposed Action or Alternatives. In addition, there are no local, state or Federal air quality regulations protecting visibility along the I-70 corridor.

Finally, it is likely that intermittent plumes of smoke due to individual pit flaring could be visible up to ten days along the I-70 corridor during each well's fifteen day completion and testing period.

AQ12 ***The CDPHE-APCD would like the SEIS to address the relative contributions of the proposed project and of all local oil and gas resource development to area emissions and visibility impairment. A "back-of-the-envelope" emissions inventory for I-70, Rifle, Silt, and nearby major sources would be useful in this regard. Comprehensive emissions inventories have been developed for Grand Junction and would provide a useful benchmark for assessing the relative scales of contribution of the proposed project.***

Response: As required by NEPA, BLM described the background air quality conditions, predicted potential direct and cumulative air quality impacts from the Proposed Action and Alternatives, and compared those impacts to applicable air quality standards or other thresholds in order to determine the significance of predicted potential impacts. The cumulative impact analysis included anticipate air quality impacts from individual wells' operations, compressor stations' expansions, and other emission sources regardless of land ownership. As stated in the Draft SEIS Addendum: "No significant, adverse impacts to air quality are anticipated from implementation of the Proposed Action or Alternatives."

As the primary air quality regulatory agency (subject to EPA review) responsible for establishing air quality goals and regulating air pollutant emission sources in the State of Colorado, it is understandable the CDPHE-APCD would like to know what affect all emission sources have on air quality throughout the State, whether or not regulations have been established to address these issues. BLM is willing to work with the State to investigate these issues, but such broad-based air resource management concerns are beyond the scope of the Draft SEIS air quality impact assessment.

AQ13 ***There has been inadequate analysis and disclosure of potential degradations to these Class One Airsheds in the Draft SEIS from cumulative impacts of full field development over the life of this oil and gas field. The AWW would like to see full disclosure of the cumulative impacts of full field development over the course of the productive life of the field.***

Response: Please see Response AQ1.

AQ14 *All lessees should use the Best Available Control Technology (BACT) for all aspects of oil and gas production.*

Response: The determination of potential Air Quality-Related Value impacts, and requirement for incorporating BACT, are the responsibility of the CDPHE-APCD (with EPA oversight) during PSD permitting under the New Source Review process as specified by the Clean Air Act.

AQ15 *Thus, the entire field should be treated as a single unit in regards to its potential impacts to air quality in downwind Class One Airsheds. Cumulative impacts analysis should consider all significant meteorological information including, but not limited to, prevailing and seasonal wind patterns and irregular phenomenon like temperature inversions in the WRNF's ubiquitous mountain valleys.*

Response: A separate assessment predicting potential cumulative far-field air quality impacts was conducted (Vimont 1998) for the entire study area, based on 1990 archived MM5 global circulation model data, surface and upper air (radiosonde) meteorological data collected at Grand Junction, Colorado, as well as meteorological data collected at several Remote Automatic Weather Station (RAWS) locations.

AQ16 *The Aspen Wilderness Workshop would like to see the BLM contract with an experienced contractor to perform an analysis of all air quality impacts associated with oil and gas developments on BLM lands in this corridor. This analysis would include the cumulative effect of all oil and gas developments in the region occurring on both private and public lands, including all current and potential oil and gas development activities on both the White River and Grand Mesa National Forests.*

Response: Please see Response AQ12. In addition, as the primary air quality regulatory agency (subject to EPA review) responsible for establishing air quality goals and regulating air pollutant emission sources in the State of Colorado, the CDPHE-APCD is the appropriate agency to conduct the broad-based analysis recommended by the reviewer. BLM is willing to work with the CDPHE-APCD, EPA and USDA-Forest Service to investigate these issues, but such broad-based air resource management concerns are beyond the scope of the Draft SEIS air quality impact assessment. Clearly, the USDA-Forest Service should conduct similar analyses for oil and gas leasing activities under their jurisdiction.

AQ17 *If there is not already a monitoring station in the Flattops Wilderness Class I Airshed, then one should be established. Being the closest Class One Airshed and more directly downwind, emissions from oil and gas developments would most likely degrade the Flattops first. Baseline data from our Maroon Bells-Snowmass Wilderness Monitoring program could be transposed to the Flattops to serve as a baseline reference point.*

Response: The closest location to the PSD Class I Flat Tops Wilderness Area with complete visibility data is the PSD Class I Mount Zirkel Wilderness Area. Except for some very limited teleradiometer data collected in the early 1980's, and extensive ongoing lake chemistry and affected lichen research, no air quality data are collected in the PSD Class I Flat Tops Wilderness Area. However, as in Mount Zirkel, the USDA-Forest Service (in cooperation with the CDPHE-APCD) could collect background air pollutant, meteorology, atmospheric deposition and visibility (extinction) data at the PSD Class I Flat Tops Wilderness Area in the future.

AQ18 *In several places in the text the area is described as arid, usually in the context of difficulty of reclamation. The definition of "arid" climate, at these average temperatures, is one that receives less than 7 inches of precipitation per year. Region 4 would be considered semi-arid.*

Response: Under Köppen's classification of climates, the study area is classified as a combination of cool semiarid/steppe (dry, designated BSk) and cold snow-forest with no distinct dry season and a hot summer (temperate, designated Dfa). Given the considerable micro-climatic variations found in the study area, a "mountain" or "highland" climate description may be more appropriate, but the study area clearly does not have an "arid" (desert) climate.

AQ19 *We are aware that the National Park Service (NPS) is conducting an analysis of the "far-field" effects of the proposed action including such things as nitrate deposition, visibility impacts, etc. We are concerned that information regarding their analysis is not included or referenced in the SEIS. The final*

SEIS and ROD may be delayed if the NPS findings are significant. We are also concerned that mitigation may be included in the final version of the SEIS in response to NPS analysis without an opportunity for industry and other public comment.

Response: Please see Response AQ1.

AQ20 *GVCA is concerned about the lack of discussion and evaluation of potential cumulative effects on air quality from gas drilling in Region 4.*

Response: Please see Response AQ1.

AQ21 *For cumulative impacts to visibility and air quality, the EIS should not limit its analysis to individual wells as point sources rather, the entire project should be considered a point source. Additionally, emissions from all the oil and gas development on private land and other emission sources whether on federal, state or private lands should be taken into account in the cumulative impact analysis.*

Response: Please see Response AQ12.

AQ22 *We wish to remind BLM that the cumulative effects of 32 wells per square mile in Region 4 could have disastrous effects on human health and welfare. The BLM may not argue, as they have in other sections of this report, that the effect that drilling on public land has on the environment is insignificant when all the drilling on private land is considered. It is clear that it is the BLM's responsibility to consider the cumulative effects of all drilling activity in Region 4. There have not been, and there will not be, any studies of air quality impacts from gas activity from the Colorado state government. This has to be the responsibility of our federal government.*

Response: Please see Responses AQ8 and AQ12.

AQ23 *The section that deals with air quality is totally inadequate. It states that the BLM is ASSUMING no significant impact on air quality from gas drilling on public land by relying on the results from a study that was conducted in the Rock Springs district of Wyoming (BLM 1998).*

Response: Please see Response AQ1.

AQ24 *The air quality section in the Draft SEIS goes on to make other false assumptions: "At the proposed level of well field development, seldom more than four wells throughout the project area, and rarely more than two wells in close proximity, would be flared at any one time." Draft SEIS at 4-2. This statement is false. A drive down I-70 at night will reveal more than four wells burning at any one time within sight of the road.*

Response: As stated in the Draft SEIS [Section 2.2, Reasonable Foreseeable Development (RFD)]: "The RFD is the level of oil and gas development activity that an objective reviewer might reasonably expect to occur over the next twenty years. The RFD is not a prediction of future activity but rather an assumed level of activity that is used in the analysis of environmental consequences. The selected RFD is based on the average activity for the last five years, 62 wells drilled per year. For simplicity's sake, this has been rounded to 60 wells per year. Over the 20 year period of analysis, this would amount to 1,200 additional wells drilled on fee and Federal mineral estate."

It is estimated that during testing, each well could flare 24 hours/day for up to ten days during the 15 day completion and testing period. Therefore, a maximum total of 600 24-hour periods of flaring would be required each year throughout the development area. This level of activity could be accomplished by flaring four wells concurrently throughout the project area within only 150 days each year. Given the economics of consecutive drilling with a single drill rig, it is unlikely more than two wells would be drilled and flared concurrently within close proximity.

AQ25 *State of Colorado air pollution permits and notices should be required. ... The assumption that "project-wide air quality impacts" will be analyzed by the State Health Department is FALSE. Fortunately, the BLM is required to do cumulative effects analysis. We are expecting the BLM to follow through on its responsibility. Without further study of this issue, BLM is risking human health and welfare, and air quality in Class I Wilderness Areas unnecessarily.*

Response: Please see Response AQ8. In addition, as stated in the Draft SEIS Addendum: "The CDPHE-APCD is the air quality regulatory agency responsible (under their EPA-approved "State Implementation Plan") for determining potential impacts once detailed development plans have been made, subject to applicable air quality laws, regulations, standards, control measures and management practices. Therefore, the State of Colorado has the ultimate responsibility for reviewing and permitting air pollutant emission sources before they become operational."

AQ26 *The BLM should require state-of-the-art pollution control technologies such as solar-powered electric compressors, VOC recapture units, non-toxic drilling fluids and remote monitoring. Electrically powered compression, rather than natural gas fired equipment, would help eliminate NO_x, CO, Volatile Organic Compounds (VOC), and PM (Particulate Emissions). If natural gas fired equipment is used for compression, require installation of BACT to limit exhaust emissions. The BLM should require BACT for BTEX, NO_x, PM, CO, SO_2, VOC, and other handful air emission emissions, and MACT for Hazardous Air Pollutants (HAPS), at all production facilities. VOCs and all hazardous pollutants should be destroyed at all well locations or at centralized facilities. The BLM should not allow venting of the wells to the atmosphere. Atmospheric tankage should include vapor recovery systems to eliminate VOC and other hazardous pollutant emissions. Additionally, the BLM should ensure that personnel have minimal exposure to hazardous compounds and should consider monitoring BTEX exposure of personnel.*

Response: The Draft SEIS Addendum stated: "No significant, adverse impacts to air quality are anticipated from implementation of the Proposed Action or Alternatives," and that "Air pollution impacts are limited by state and Federal regulations, standards, and implementation plans established under the Clean Air Act and administered by CDPHE-APCD. Colorado regulations require proposed air pollutant emission sources undergo a permitting review, including dehydrators, separators, and gas compressors. Therefore, CDPHE-APCD has the authority to review emission permit applications and to require emission permits, fees and control devices prior to construction and/or operation. In addition, the United States Congress (through the Clean Air Act Section 116) authorized local, state and tribal air quality regulatory agencies to establish air pollution control requirements more (but not less) stringent than Federal requirements. Additional site-specific air quality analysis would be performed, and additional emission control measures including "Best Available Control Technology" may be required to ensure protection of air quality resources." All on-site personnel (including operators, Bureau employees, and other contractors) are subject to OSHA regulations regarding hazardous materials, assuring their potential exposure will be minimized and within acceptable levels.

AQ27 *We understand that the Final EIS for leasing will include a more detailed discussion and quantitative analysis of potential air pollution impacts on the nearby Flat Tops and Maroon Bells Class I wilderness areas from oil and gas development which could result from implementation of the proposed leasing decision.*

Response: Please see Response AQ1. In addition, a separate assessment predicting potential far-field air quality cumulative impacts (Vimont 1998) was conducted using conservative assumptions regarding emissions, plume transport time, humidity, and conversion of NO_x to ammonium nitrate. Based on these numerous "reasonable, but conservative" analysis assumptions, the 1.0 deciview "just noticeable change" threshold level is not likely to occur at the PSD Class I Flat Tops Wilderness Area from the Proposed Action or Alternatives. While not specifically modeled, impacts at the PSD Class I Eagles Nest, Maroon Bells-Snowmass, and West Elk wilderness areas, and the PSD Class II Holy Cross and Raggeds wilderness areas would be less than those described for the PSD Class I Flat Tops Wilderness Area.

The USDA-Forest Service, Region 2, has established a 0.5 deciview "Limit of Acceptable Change" to evaluate potential significant visibility impacts at their wilderness areas. Based on this more restrictive 0.5 deciview level, the Proposed Action is predicted to exceed the USDA-Forest Service "Limit of Acceptable Change" under the first-and second-maximum 24-hour predicted impacts. BLM performed it's analysis of potential visibility impacts at the 0.5 deciview level at the request of the USDA-Forest Service, Region 2, not based on any legal requirement, and any predicted visibility impacts below 1.0 deciview "just noticeable change" threshold would not be perceptible.

AQ28 *The Forest Service requests that the air quality analysis for the GSRA SEIS consist of a quantitative analysis of cumulative air quality impacts on visibility and acidic deposition impacts to high elevation lakes.*

Response: Please see Response AQ1. In addition, please see the Draft SEIS Addendum, page 21, which describes cumulative annual atmospheric deposition at the PSD Class I Flat Tops Wilderness area.

AQ29 *The Forest Service has developed limits of acceptable change or thresholds that should be used in assessing pollutant impacts to visibility and lake chemistry in the potentially affected Class I areas.*

Response: As described in the Draft SEIS Addendum, BLM compared potential atmospheric deposition impacts to the USDA-Forest Service, Region 2, terrestrial ecosystem "Limit of Acceptable Change" threshold value of 3 kg/ha-yr, and potential visibility impacts to the USDA-Forest Service, Region 2, visibility "Limit of Acceptable Change" threshold value of 0.5 deciview. However, BLM performed the analysis of potential visibility impacts at the 0.5 deciview level only at the request of the USDA-Forest Service, Region 2, not based on any legal requirement, and any predicted visibility impacts below the 1.0 deciview "just noticeable change" threshold would not be perceptible.

AQ30 *For more than a decade, the Forest Service and the U.S. Geological Survey have been collecting Air Quality Related Values (AQRV) data in the Maroon Bells and Flat Tops wilderness areas to the south and north of the Glenwood Springs Resource Area. The Forest Service invites the BLM to use this data as a baseline to aid in modeling impacts on wilderness AQRV's from oil and gas activities which are projected to occur as a result of implementation of the proposed leasing action.*

Response: Please see Responses AQ8 and AQ14.

AQ31 *The EPA is disappointed that the appropriate cumulative impacts, particularly on regional air quality in the nearby Flat Tops Wilderness, were not analyzed in the Draft SEIS.*

Response: Please see Response AQ1.

AQ32 *EPA's interest in the cumulative impact assessment is to attempt to determine if the Class I visibility and increment limitations in effect for the Flat Tops Wilderness are jeopardized by the industrial activities in the region. Disclosure of this assessment should be part of this EIS process even if the BLM is not accountable for the control of these emissions. We want to determine if such cumulative impacts are significant and how to work with the State of Colorado and the oil and gas companies to mitigate such effects. Such cumulative emissions might need to be mitigated both to maintain the environmental quality of the Class I area and to help assure that continued oil and gas activities are not delayed or reduced as a result of unmitigated actions either on public land or nearby.*

Response: Please see Responses AQ6 and AQ8.

AQ33 *EPA recommends preparation of a cumulative air quality impact analysis and review by both the Forest Service and EPA as soon as possible. Then host a meeting of the three federal agencies and the COGCC to discuss and understand the results. Cooperative efforts at that stage could then be reported in the Final Supplemental EIS.*

Response: Please see Responses AQ1 and AQ12. In addition, BLM is also available to discuss analysis results with state and Federal agencies upon request.

AQ34 *Draft SEIS, Section 3.2, Air Quality, pg. 3-1. The units for particulate concentrations should be œg/m^3.*

Response: This typographical error was corrected in the Draft SEIS Addendum.

AQ35 *Draft SEIS, Section 3.2, Air Quality, pg. 3-2. Top left. A map showing the locations of the PSD Class I areas with respect to the GSRA should be included.*

Response: A map of the analysis area, including several PSD Class I and other sensitive areas, is included in the cumulative impact analysis report (Vimont 1998).

AQ36 *Draft SEIS, Section 3.2, Air Quality, pg. 3-2. This section should include a windrose showing the frequency of wind speed and direction for this area.*

Response: As reported in the support documents (Notar 1998 and Vimont 1998), the near- and far-field air quality impact assessments used specific meteorology data collected at several locations. "Wind rose" data were not utilized, although wind rose graphic presentations are available in the general literature (including the EPA-Region VIII offices).

AQ37 *Draft SEIS, Section 4.2. Climate, pg. 4-1. A short discussion on the role of methane and its combustion products (ie. CO_2) on global climate change should be included in this* *section. There are global climate issues related to fossil fuel development.*

Response: Methane, carbon dioxide, and several other atmospheric chemicals have been postulated to have an effect on global climate. However, both the nature and the degree of this suspected relationship are unknown at this time.

AQ38 *Draft SEIS, Section 4.2. Climate, pg. 4-2. This section should present air dispersion modeling results showing air quality impacts with respect to National Ambient Air Quality Standards and the PSD Class I increment.*

Response: Please see Response AQ1.

AQ39 *Draft SEIS, Section 4.2. Climate, pg. 4-2. The paragraph prior to Section 4.3 could be revised as NEPA is not an air permitting effort. The NEPA analysis includes reasonably foreseeable future development and impacts to Class I areas which are not covered by CDPHE-APCD for minor sources. Stating that "air quality analyses would be performed to ensure protection of air quality resources" by APCD does give either the public or the decision maker information with which to base a decision.*

Response: As stated in the Draft SEIS Addendum: "No significant, adverse impacts to air quality are anticipated from implementation of the Proposed Action or Alternatives." Therefore, no further mitigation measures are necessary.

The reviewer has selected only a portion of the actual conclusion presented to the public and the decision maker. The complete conclusion, as stated in the Draft SEIS Addendum is: "Finally, in reviewing these predicted impacts, it is important to understand the assumptions made regarding resource development. In developing this analysis, there is a great deal of uncertainty in ultimate plans (i.e., number of wells, equipment to be used, specific locations) for resource development. All of these factors affect air emissions, as well as predicted air quality impacts. This analysis was based on a "reasonably foreseeable" development scenario, including the number of wells, well spacing, equipment necessary, and assumed emission rates. Thus, the projected impacts represent a conservative upper estimate of potential air quality impacts which are unlikely to be reached.

"It is important to note that before development could occur, CDPHE-APCD would review specific air pollutant emissions preconstruction permits which examine potential project-wide air quality impacts above statutory minimum levels. As part of these permits (depending on source size), CDPHE-APCD could require a cumulative air quality impacts analysis. Thus, as development occurs, additional site-specific air quality analyses would be performed to ensure protection of air quality resources."

AQ40 *We are concerned that the assumptions made as part of the impact analysis overstate the emissions associated with oil and gas development and that the predicted impacts will also be exaggerated. The assumed level of compression required for future natural gas development, and the associated emissions, has been overstated by the "reasonable and foreseeable" scenario. A continuous four-rig program is conservative and a simple 20 percent increase in level of compression is more likely.*

Response: Please see Response AQ39. In addition, as stated in the Draft SEIS Addendum: "It is anticipated field-wide compression would increase from approximately 19,000 hp to 38,000 hp (at six existing compressor locations), and that proposed wells limit fugitive volatile organic compound (VOC) emissions to 20.0 tons per year (although average field-wide VOC emission would be much less). The assumed linear increase in compression ignores potential efficiencies in scale."

If actual compression-related emissions increase by only 20 per cent (rather than doubling), actual impacts would be much less than those presented in the Draft SEIS Addendum. However, even at an assumed doubling of emissions, no significant, adverse impacts to air quality are anticipated from implementation of the Proposed Action or Alternatives.

AQ41 *The factors used in estimating the amount of emissions associated with each horsepower of compression required are overstated. The estimates of emissions associated with currently installed compressors are apparently based on permit limits which are in turn based on full-time, full-power operation. In practice, compressors are not operated full-time due to maintenance requirements, and do not operate continuously at full load. Conservatively, Barrett estimates current emissions to be no more than 80 percent of the permit levels.*

Response: As stated in the Draft SEIS Addendum, "Given the speculative nature of the Proposed Action and alternatives, definitive information is not always available, and it is necessary to make 'reasonable, but conservative' assumptions to assure any significant, adverse impacts would be disclosed. However, when several 'reasonable, but conservative' assumptions are combined in the overall analysis, the resulting predicted impacts will overestimate the actual conditions that would occur."

If actual compressors operate at only 80 per cent of the time at the assumed emission rates, long-term (but not maximum 24-hour) impacts would be less than those presented in the Draft SEIS Addendum. However, even at the assumed emission levels, no significant, adverse impacts to air quality are anticipated from implementation of the Proposed Action or Alternatives.

AQ42 *Another factor that will offset growth in compression is depletion of the Wasatch formation. Production from the Wasatch is declining now and production will be insignificant within ten years. All Wasatch production is currently compressed and this capacity will either be eliminated or will offset growth in Mesa Verde compression requirements.*

Response: If less compression is actually required, then actual impacts would be less than those presented in the Draft SEIS Addendum. However, even at an assumed doubling of compression emissions, no significant, adverse impacts to air quality are anticipated from implementation of the Proposed Action or Alternatives.

AQ43 *Barrett would support assessment of emission levels that are 20 percent greater than current actual levels. In effect the emissions presented as "current" in the analysis are equivalent to what Barrett would predict at peak production. As is, we do not believe that the modeled range of conditions is inclusive of the actual emissions to be realized.*

Response: Please see Response AQ40.

AQ44 *Barrett objects to both the "High" and "Low" emission scenarios included in the analysis at the request of the USDA Forest Service. It is neither reasonable nor foreseeable to forecast that operators would remove the low NO_x design compressors that have already been installed and replace them with high emitting units. Nor is it realistic to assume that operators would now begin installing high emission units. Modern low-emission units operate more economically than less sophisticated designs. In addition, the effective life of a compressor is 20 years or more and operators are not likely to invest in units that will be obsolete from a regulatory standpoint in the event that they are relocated. These factors have apparently come into play when industry has selected compressors in the recent past. Over the past five years, every compressor installed by Barrett and others operating in the area has been of a low emission design.*

Response: BLM generally agrees with the reviewer that "It is neither reasonable nor foreseeable to forecast that operators would remove the low NO_x design compressors that have already been installed and replace them with high emitting units. Nor is it realistic to assume that operators would now begin installing high emission units."

However, as stated in the Draft SEIS Addendum: "The USDA-Forest Service, Region 2 (Haddow 1998) believes the State of Colorado could permit existing natural gas compressors to be replaced, and additional compressors installed, at NO_x emission rates much greater than are currently in operation. Therefore, at their request, a "high" compressor NO_x emission rate scenario was also analyzed. Since the State of Colorado does not have a statewide BACT requirement, it is possible that all existing and future compressors could be permitted at emission rates much greater than the current emission rates (up to 20.1 gm/hp-hr NO_x as opposed to the current 2 to 4 gm/hp-hr NO_x emission rates). ... Although such a replacement is theoretically possible, it is extremely unlikely either the operators would consider, or that the State of Colorado would permit, such a replacement with much dirtier equipment."

AQ45 *The "Low" NO scenario is not realistic. It is not reasonable to assume that existing compressors would be replaced with 1.5 gram per horsepower/hour units. The availability of compressors in the required capacity ranges that are able to achieve 1.5 gram/horsepower/hour is limited. To Barrett's knowledge, no state implementing BACT process has required that existing compressors be removed and replaced solely to meet BACT.*

Response: BLM generally agrees with the reviewer that "It is not reasonable to assume that existing compressors would be replaced with 1.5 gram per horsepower/hour units."

However, as stated in the Draft SEIS Addendum: "... both the states of Utah and Wyoming have limited similar natural gas compressor NO_x emission rates to 1.5 gm/hp-hr. Therefore, a "low" compressor NO_x emission rate was also analyzed ..." BLM analyzed the "low" compressor NO_x emission rate as a direct comparison to the "high" compressor NO_x emission rate scenario identified by the USDA-Forest Service, Region 2 (Haddow 1998), so that the public and the decision maker could evaluate a full range of potential (although unlikely) impacts.

AQ46 ***The USDA Forest Service "high" and "low" emission scenarios appear to be constructed to demonstrate the necessity of additional regulation (BACT) rather than disclosure of impacts from oil and gas development in this area. We believe it is irresponsible to use the SEIS as a forum to influence public opinion to this end. The impression given to public, who is likely to be uninformed in these matters, is that industry is either unregulated ("high" NO_x case) or polluters for not having done more ("low" NO_x case).***

Response: Please see Response AQ26. In addition, the "high" compressor NO_x emission rate scenario was analyzed at the request of the USDA-Forest Service, Region 2 (Haddow 1998). However, as stated in the Draft SEIS Addendum: "Since the State of Colorado does not have a statewide BACT requirement, it is possible that all existing and future compressors could be permitted at emission rates much greater than the current emission rates (up to 20.1 gm/hp-hr NO_x as opposed to the current 2 to 4 gm/hp-hr NO_x emission rates)."

AQ47 ***There is no discussion of climate outside Region 4.***

Response: Although the Draft SEIS evaluated potential impacts throughout the entire resource area, the Draft SEIS Addendum described the Climate Affected Environment for locations in Region 4. However, the climatic conditions described are applicable for most locations located throughout western Colorado.

AQ48 ***The SEIS states that it used PSD increments as a reasonable, conservative comparison of impacts on air quality. However, if the PSD baseline has been triggered, part of the increment may have been consumed by other sources and comparing this proposed impact to the full increment may not reveal the real limits. Without more details on the proposed emission inventory, ambient standards, modeling, and true PSD evaluation, it is not possible to agree that the project will not have significant adverse impacts on air quality. At best, it suggests that another SEIS will be required in the future when development plans are more firm, allowing a detailed assessment of air quality to be made at that time.***

Response: Please see Response AQ25. In addition, as stated in the Draft SEIS Addendum: "The PSD Program is designed to limit the incremental increase (depending on the location's classification) of specific air pollutant concentrations above a legally defined "baseline" level. All NEPA analysis comparisons to the PSD Class I and II increments are intended to evaluate a "threshold of concern," and do not represent a regulatory "PSD Increment Consumption Analysis." The determination of PSD increment consumption is a regulatory agency responsibility conducted as part of the New Source Review process, which also includes a Federal Land Management Agency's evaluation of potential impacts to AQRV such as visibility, aquatic ecosystems, flora, fauna, etc."

Therefore, the CDPHE-APCD is the air quality regulatory agency primarily responsible (subject to EPA review) for implementing PSD permitting requirements of the Clean Air Act, including a "PSD Increment Consumption Analysis." BLM simply compared potential air quality impacts to the PSD Class I and II increments as a "threshold of concern." Once an actual permit application is submitted, if the CDPHE-APCD determines that applicable PSD increments are not available, the specific project would not obtain a permit to operate.

AQ49 ***A number of questions are raised by the air quality analysis contained in the Draft SEIS Addendum under Section 4.2. On page 15 the text states that §116 of the Clean Air Act allows local, state and tribal regulatory agencies to establish air pollution control requirements more stringent than the federal requirements. Have any of these jurisdictions done so with regard to the Resource Area? If so, are they significant to this proposal and are they addressed in this SEIS?***

Response: Applicable local, state and tribal air pollution control requirements more stringent than the federal requirements were incorporated into the analysis (i.e.; the Colorado three-hour SO_2 Ambient Air Quality Standard), as shown in Table 3.2-1 of the Draft SEIS Addendum. However, even based on these more restrictive requirements, as stated in the Draft SEIS Addendum: "No significant, adverse impacts to air quality are anticipated from implementation of the Proposed Action or Alternatives."

AQ50 *Why does BLM believe that BACT may be required to protect the air quality resources?*

Response: As stated in the Draft SEIS Addendum: "Under FLPMA and the Clean Air Act, BLM can not conduct or authorize any activity which does not conform to all applicable local, state, tribal and Federal air quality laws, statues, regulations, standards, and implementation plans." Therefore, actual development can not violate state or Federal ambient air quality standards or hazardous air pollutant requirements.

Once an actual permit application is submitted, the CDPHE-APCD is the air quality regulatory agency primarily responsible (subject to EPA review) for determining the applicability and degree to which BACT would be required. BLM simply analyzed and disclosed potential air quality impacts based on "reasonable, but conservative" air pollutant emissions assumptions and did not attempt to define BACT.

AQ51 *Under the proposed action section, the statement is made that rural background PM_{10} concentrations are likely to be less than those measured in Rifle, Colorado. Please provide the documentation underlying this assumption. Rural areas usually have high background particulate levels due to agriculture and other soil disturbing activities and flares. This runs counter to the assumption.*

Response: Total particulate concentration episodes due to agricultural disturbance and other wind-blown sources in rural portions of the analysis area are in a size range larger than the background PM_{10} particulates measured at Rifle, Colorado, and therefore not additive. In addition, particulate matter emissions due to well completion and testing (flaring) were specifically modeled in the near-field impact assessment (Notar 1998).

AQ52 *Please also explain the assumed connection between ambient concentrations of air pollutants in the air, which is a health standard, and odors, which is a nuisance standard. The analysis makes the assumption that since burned natural gas does not contain sulfur compounds and ambient concentrations would be below applicable air quality standards, thus potential odors would not have a significant adverse impact. This does not follow.*

Response: The burning of natural gas during the ten day completion and testing process could increase both the level and aerial extent of noticeable odors from combustion products. However, since the natural gas does not contain sulfur compounds, and predicted air pollutant concentrations would be below applicable secondary ambient air quality standards (established to prevent significant welfare impacts, including odors), potential odors would not have a significant adverse impact during operation.

AQ53 *Draft SEIS, Addendum, pg. 17, in the first full paragraph. Please explain how the assumptions of the "seldom" and "rare" operating scenarios tie into the emissions totals and the conclusion that permit requirements will not be triggered and that ambient standards will not be exceeded.*

Response: At the proposed level of well field development, seldom more than four wells throughout the project area, and rarely more than two wells in close proximity, would be flared at any one time. Therefore, cumulative interaction of completion and testing air pollutant emissions from more than two wells is not likely. In addition, given the temporary nature (ten days or less) and low levels of potential emissions (less than 2 tons of any regulated air pollutant), it is unlikely the State of Colorado would require air pollutant emission permits for individual well completion and testing activities. Therefore, all completion and testing CO, NO_x and PM_{10} impacts are assumed to be less than applicable Colorado and National Ambient Air Quality Standards.

AQ54 *Draft SEIS, Addendum, pg. 18. It is noted that it is possible that NO_x emissions could exceed state and federal ambient air quality standards. It is also noted that benzene formaldehyde could exceed the state's acceptable ambient concentration levels. If these limits are exceeded, will gas development be limited?*

Response: Please see Responses AQ44 and AQ50. In addition, as stated in the Draft SEIS Addendum: "No significant, adverse impacts to air quality are anticipated from implementation of the Proposed Action or Alternatives."

Regarding potential hazardous air pollutant impacts, Benzene was erroneously indicated to exceed any state Acceptable Ambient Concentration Levels (AACL) in the Draft SEIS Addendum. As also stated in the Draft SEIS Addendum, "Since neither the State of Colorado nor EPA have established HAP standards, eight-hour HAP concentrations were . . . compared to a range of eight-hour state AACL" and "formaldehyde is the only HAP predicted to exceed the lower end of the range of states' AACL" (established by the Pinellas County, Florida, Air Pollution Control Board).

AQ55 *Draft SEIS, Addendum, pg. 18, includes the statement that neither the State of Colorado nor EPA have established HAP standards. Is this statement made in regard to certain pollutants and sources? The state does have AACLs and these are standards. The HAP for benzene formaldehyde is predicted to exceed the state AACL. Is this under the state regulations? EPA does have standards for HAPS. Has EPA promulgated, is it scheduled to promulgate or will the state have to promulgate Maximum Achievable Control Technology (MACT) requirements for the area? If the Resource Area sources are not on EPA's list of sources slated for MACT standards, they will not meet MACT requirements. If they are, the state will have to define MACT for these sources if EPA has not already done so.*

Response: Please see Responses AQ8 and AQ54. Additional site-specific hazardous air pollutant analysis and additional emission control measures including MACT may be required by the CDPHE-APCD during permitting in order to limit actual hazardous air pollutant impacts.

AQ56 *Draft SEIS, Addendum, pg. 19. The discussion of risk appears irrelevant. Risk factors are behind the AACL.*

Response: The range of states' AACL reported in the Draft SEIS Addendum is based on potential eight-hour acute exposure risks. As stated in the Draft SEIS Addendum, "Long-term (70-year) exposures from suspected carcinogenic emissions (e.g., formaldehyde) were used to estimate the latent cancer risk at the nearest residence (200 m from a well site and compressor)." The potential Most Likely Exposure (MLE) and Maximally Exposed Individual (MEI) risk analyses were made independent of the states' eight-hour AACL values.

AQ57 *Draft SEIS, Addendum, pg. 20. It is odd that discussion was included on the "no action alternative" since the SEIS determined at the outset not to include this alternative.*

Response: As stated in the Draft SEIS: "Customarily, an EIS includes a No Action Alternative. In the case of this SEIS, no action would amount to continuing the current management and so the Continuation of Current Management Alternative is considered to accomplish the intent of the No Action alternative."

AQ58 *Draft SEIS, Addendum, pg.22. Air quality related values are not the same as a visible plume but are determined by the land managers and are more qualitative than quantitative. The analysis on page 22 concludes that under certain operating scenarios, visibility impact could occur at all Class I wilderness areas. What limits will be imposed upon the Resource Area to eliminate these concerns, and why was only one Class I area modeled? In addition, what is the rationale for concluding that the impact would be less in other Class I areas? This analysis needs further clarification and explanation.*

Response: Please see Response AQ28. In addition, as stated in the Draft SEIS Addendum, "The determination of PSD increment consumption is a regulatory agency responsibility conducted as part of the New Source Review process, which also includes a Federal Land Management Agency's evaluation of potential impacts to AQRV such as visibility, aquatic ecosystems, flora, fauna, etc." Therefore, a Federal Land Management evaluation of a PSD permit application may define a "visible plume" as an AQRV. In addition, some AQRV impact analyses are very rigorous and quantitative.

AQ59 *The SEIS should address the proposed regional haze program.*

Response: We assume the reviewer is referring to EPA's proposed national regional haze regulations, which have not yet been promulgated. Although BLM can not speculate how the proposed regulations will finally be enacted, the CDPHE-APCD will be required to develop a visibility "State Implementation Plan," which will become law upon approval by EPA. Much like the recently revised ozone and $PM_{2.5}$ Ambient Air Quality Standards, as stated in the Draft SEIS Addendum: "these revised limits will not be applicable until formally approved in the Colorado State Implementation Plan." At that time, all BLM authorized activities will have to conform to the new regional haze regulations.

AQ60 *Tom Brown, Inc. believes that the Continuation of Current Management Alternative will provide adequate protection for the climate and air quality in the GSRA and surrounding communities. Even with no significant adverse impacts anticipated, we feel the estimated emissions, and subsequent alleged impacts, are based on inaccurate or over-estimated assumptions. The "worst-case" scenario assumed by the BLM in the SEIS does not represent current practices used in the oil and gas industry. For instance, the Draft SEIS, Addendum, under section 4.2, states that the amount of compression would increase from 12,000 to 32,000 hp on a field-wide basis; consequently, operation emissions would increase. We feel that this is an inaccurate assumption because the compression rate is not necessarily based on the number of wells, but rather on the rate of gas production. The gas production rate varies over a well's lifetime, with peak production occurring at and shortly after start-up. Generally, a 75 percent drop in well production is seen in the first one to two years of operation. Hence, basing annual emissions on the start-up concentration generates excessive emissions estimates and is not typical practice. Even CDPHE-APCD, the government agency tasked with administering air quality procedures, recognizes this scenario by including terminology and flexibility in their permitting process to account for these temporarily higher emissions.*

Response: Please see Responses AQ8, AQ40, AQ41 and AQ42.

AQ61 *BLM assumes that each compressor will be operated full time at 100 percent capacity. It is generally poor engineering practice to operate a compressor at full capacity due to maintenance requirements. Additionally, the demand for 100 percent usage does not exist except for occasionally at start-up as described above.*

Response: Please see Response AQ41.

AQ62 *It is a well-documented fact that natural gas provides a cleaner, more environmentally friendly form of fuel for vehicles, electric generation, and myriad other uses. BLM should incorporate this into its analysis of air quality, and analyze the possible benefits that could be derived from the burning of natural gas, as opposed to "dirtier" forms of fuel. Current oil and gas practices also incorporate the use of natural gas as the fuel for the majority of well-site compressors. The CDPHE-APCD also has special provisions for fuel burning equipment that uses natural gas as its fuel in acknowledgment of the lower emission rates achieved with the use of this fuel.*

Response: BLM generally agrees with the reviewer that "natural gas provides a cleaner, more environmentally friendly form of fuel" than other fossil fuels (such as diesel, gasoline or coal) as exemplified by the United States Congress in providing natural gas development incentives for improving the nation's air quality.

AQ63 *In the Draft SEIS, Addendum, it is stated that "four per cent of the proposed wells would require installation of BACT (combustion controls) to minimize fugitive volatile organic compounds." While emphasizing the use of combustion controls, the CDPHE-APCD also recognizes that technological or economic limitations of a particular control to an emissions unit may "make the imposition of an emissions standard infeasible." (Common Provisions Regulation, Colorado Air Quality Control Commission, Revision Adopted 12/21/95, page 13). Hence, APCD also allows for operational and work practice modifications to be applied at BACT in order to reduce emissions. BACT can include operating at no more than a given percentage under 100 percent, modified operations after start-up, and changing fuel-use to a cleaner fuel. As described above, these operational modifications are already standard practice in the oil and gas industry. Hence, the CCM Alternative is already supported by conditions stipulated by CDPHE-APCD.*

Response: A number of the "reasonable, but conservative" analysis assumptions applied in the Draft SEIS Addendum are based on existing laws, regulations and demonstrated engineering practices.

AQ64 *Air quality effects as a result of oil and gas activity will be negligible with respect to the other activity in the GSRA, including uncontrolled truck and auto traffic along I-*

70; unregulated and uncontrolled rail traffic on this major rail route; and residential and commercial growth activities and the associated furnace, water heater, etc. emissions. Any adverse effects to the Class I area should include these factors in addition to the comparatively minor emissions from the oil and gas activities in the area.

Response: The Draft SEIS Addendum assumed the emission sources referred to are adequately represented by the Affected Environment, or "background" conditions. It was assumed that increases in the emission source categories would be offset by future improvements in emission control technologies. Therefore, the Draft SEIS Addendum analysis considered these emission source categories, although their direct impacts were not specifically modeled.

AQ65 *Details of the air quality modeling were not in the Draft SEIS, Addendum. Consequently, we are not able to comment on the technical details of the modeling process itself.*

Response: Please see Response AQ1.

AQ66 *Western Slope communities such as Montrose, Delta, and Grand Junction are increasingly concerned about degradation of visibility in and near these cities. While visibility impairment in these areas does not exceed specific state or federal standards, there is still strong community interest in preventing further degradation and improving, where possible, the local and regional visual air quality. The CDPHE-APCD supports efforts at the local level to assess the relationships between area emissions and visibility and to implement programs for reducing air quality impacts. The proposed GSRA project is relatively near these communities, and the DeBeque-Parachute-Rifle-Silt corridor is itself likely to see increasing residential development during the life of the proposed project. Consequently, the CDPHE-APCD would like the SEIS to address the relative contributions of the proposed project and of all local oil and gas resource development to area emissions, and visibility impairment. A "back-of-the-envelope" emissions inventory for I-70, Rifle, Silt, and nearby major sources would be useful in this regard. Comprehensive emissions inventories have been developed for Grand Junction and would provide a useful benchmark for assessing the relative scales of contribution of the proposed project.*

Response: Please see Responses AQ16 and AQ64.

AQ67 *The CDPHE-APCD earlier suggested that BLM model the impacts of the project on visibility along the I-70 corridor. While the potential visibility impacts in wilderness areas are considered, the Addendum does not address the contributions of the project to local visibility degradation.*

Response: Please see Response AQ11.

AQ68 *Draft SEIS, Addendum, pg. 20. BLM indicates that at "... the time of a preconstruction air quality permit application, CDPHE-APCD may require a much more detailed increment consumption analysis." The CDPHE-APCD would only require a cumulative impact analysis for PSD increments if a source to be permitted were a major source subject to PSD review and had a "significant" impact on ambient air. If none of the individual facilities met these criteria, it is likely that there would be no regulatory vehicle through which the State could assess the cumulative impacts of the entire project.*

Response: Please see Responses AQ6 and AQ8. In addition, BLM recognizes that the CDPHE-APCD, as the state's primary air quality regulatory agency, is the proper organization to conduct general air quality assessments and to regulate air pollutant emission sources in Colorado for a variety of purposes. The United States Congress delegated that authority to the CDPHE-APCD and has not given a similar air quality regulatory role to BLM.

AQ69 *Tables presenting the emissions of the project as a whole were not included in the Addendum as had been requested.*

Response: Please see Response AQ10.

AQ70 *The Draft SEIS, Addendum indicates that the proposed American Soda processing facility to be located in Parachute was included in the cumulative impact analysis. It is appropriate to include this facility, but the cumulative impacts analysis should also include the, American Soda Commercial Mine to be located in the Piceance Basin. An analysis of the potential cumulative impacts* *to the PSD Class I increment, on nitrate and sulfate deposition, and on regional visibility is not complete without the emissions from the Piceance facility.*

Response: At the time the Draft SEIS Addendum air quality impact assessment was being prepared, it appeared that only the American Soda L.L.P. Yankee Gulch Parachute nahcolite processing facility would have the potential for combining with the proposed Glenwood Springs Resource Area natural gas development activities to have potential cumulative air quality impacts. This assumption was based on the preliminary nature of the air pollutant emission level estimates, as well as the location and nature of the Yankee Gulch Piceance mining emission characteristics.

Since that time, process design and emission assumptions have been refined, and a more extensive cumulative air quality impact assessment is anticipated as part of the Yankee Gulch Sodium Minerals Project environmental impact statement.

General (GN)

GN1 *The Maximum Protection Alternative should be chosen over the Proposed Action or the Continuation of Current Management Alternative. The statement that none of the three alternatives considered will affect substantially the amount of gas produced argues for this position.*

Response: The merits of individual mitigation measures proposed in any alternative were evaluated within the context of the information provided in the Draft SEIS and comments received during the public review period as to their necessity, reasonableness and effectiveness. Selection of all elements of the Maximum Protection Alternative would have resulted in higher and sometimes unreasonable or unsupported levels of resource protection at often higher costs to the operator. Selection of all elements of the Continuation of Current Management would have resulted in inadequate levels of resource protection. The Preferred Alternative includes many of elements of both the Maximum Protection Alternative and the Continuation of Current Management Alternative. BLM has concluded that the mitigation measures contained in the Preferred Alternative provide the most appropriate balance of resource protection and economic oil and gas development. Achieving such balance is a primary objective of the Draft SEIS. Refer to Chapter 2, Section 2.6 for a discussion of the rationale for the Preferred Alternative.

In terms of cumulative production from all federal and fee wells, the change in production in Region 4 brought about by the different alternatives would not be large. However, the alternatives do result in differing production levels from federal mineral estate, especially in the NOSR Production Area. The SEIS indicates that the Maximum Production Alternative would result in 15 fewer wells than the Continuation of Current Management Alternative in the NOSR Production Area, a reduction of more than 20 percent. Additionally, while not necessarily reducing production, some of the alternative mitigation measures will result in higher operating costs. If production from leased federal mineral estate is reduced, or if the cost of production is increased, by the mitigation measures, BLM must assure that the mitigation is necessary and could not have been achieved by other means. BLM believes that the mix of mitigation measures contained in the Preferred Alternative provides needed resource protection without unduly reducing protection or increasing costs.

GN2 *The Continuation of Current Management Alternative should be chosen over the Proposed Action or the Maximum Protection Alternative. This position is supported in particular because the analysis of impacts does not justify a change in management practice*

Response: See GN1. In addition, refer to Chapter 4 for detailed information concerning the environmental effects of oil and gas development. While the SEIS documents that oil and gas, except in several high impact zones, is not the major cause of human influences on the natural landscapes in the Region 4 area, BLM has concluded that some changes to current practices are necessary. Refer to Chapter 2, Section 2.6 for a discussion of the rationale for the Preferred Alternative.

GN3 *The Draft SEIS refers a number of times to "public perceptions." BLM appears to be very responsive to public perceptions whether they are accurate or not.*

Response: Public perceptions are often the essence of an issue identified in the NEPA process; one of the objectives of that process is determining, to the degree that is possible, whether the perceptions are accurate or not. BLM believes that issues in the SEIS that were based on public perceptions were clarified and properly utilized in the process.

GN4 *BLM is responsible for protecting the areas near the Rulison blast site. These areas should be monitored and any well drilling* *and gas production should be monitored for radioactivity; there should be no drilling within 10 miles of the Rulison Blast.*

Response: BLM is, of course, only responsible for the BLM-managed mineral estate near Project Rulison. As noted in Section 1.4 of this document, the pattern of mineral ownership in Region 4 is highly dispersed. Mineral ownership in the vicinity of Project Rulison is mixed as well, with the immediately adjacent properties in the hands of private landholders, the U.S. Forest Service and the BLM. As noted in Appendix E, the conclusion of the both BLM and the COGCC is that the risk of contamination from Project Rulison is largely limited to the project site itself. As a precaution, however, all oil and gas drilling operations within a three mile radius of the Project site would be subject to oversight measures established by the COGCC which calls for wells to be reviewed by the Department of Energy for possible inclusion in their ongoing monitoring program.

GN5 *At Section 2.4.3.3, the Draft SEIS cites the Colorado Standards for Public Land Health. Are these the same as the Fundamentals of Rangeland Health at 43 CFR 4180?*

Response: The Fundamentals of Rangeland Health at 43 CFR 4180 are a nationwide expression of the standards and guidelines for grazing administration. The Colorado Standards for Public Land Health are a refinement of The Fundamentals of Rangeland Health to be used on public lands within Colorado.

GN7 *The SEIS should consider the impact of the Fundamentals of Rangeland Health and other livestock regulations promulgated by the Secretary of the Interior on the 1991 FEIS (Section 3.4).*

Response: Such an assessment would be beyond the scope of the SEIS. The livestock issues addressed in the FEIS had to do with the impact of oil and gas development on livestock grazing. The new regulations have not altered the way in which oil and gas development might affect grazing.

GN8 *The citation on page 3-16 of the Draft SEIS is one of several based on personal communication, yet Chapter 6 fails to note who had the communication and what form it took. Reliance on such communication calls into question the validity of the analysis.*

Response: BLM agrees. The references to personal communications in Chapter 6 have been clarified. The reviewer should note that such communications are often the only way to confirm site-specific resource data.

GN9 *Because of the potentially dramatic and detrimental impact federal leasing can have on private surface estate, this issue should be more fully developed in the SEIS.*

Response: The issue of impacts that may occur on private land under which the federal oil and gas mineral estate is leased is addressed in the SEIS. The impact analysis in the SEIS makes no distinction between those on BLM surface and those on split estate, i.e. private surface and federal mineral estate. Moreover, all of the mitigation available on federal surface and mineral estate is available on split estate. The legal basis for leasing of federal minerals on split estate and the ramifications for the private surface owners was not addressed in the SEIS and is not an appropriate matter for analysis in the SEIS.

BLM regulations concerning the rights of lessees to develop federally reserved oil and gas are found at 43 CFR 3814. If any split estate surface owners would like more information on the federal leasing process and their rights as surface owners, they may contact the Glenwood Springs or Lakewood offices of BLM.

GN10 *The White River National Forest is concerned about the potential for drilling within the boundaries of the BLM withdrawal for the USFS administrative site at Fravert Reservoir (The Rifle Ranger District Office).*

Response: The Forest Service administrative site has been withdrawn from entry for locatable minerals but the oil and gas reserves have been leased. BLM authority under standard lease terms would permit the relocation of a proposed wellpad beyond the boundary of the administrative site.

GN11 *The Colorado Oil and Gas Association does not believe oil and gas development is inherently a negative impact to the area. It is compatible with other uses and is an important factor in the local economy. It is less intrusive than many residential or commercial developments in the area.*

Response: BLM agrees that oil and gas development is an important component of local economies. Making public lands available for oil and gas development is an important element of BLM's multiple-use mission. Note that the overall objective for the SEIS (Chapter 1, Section 1.2) is to facilitate orderly, economic and environmentally sound exploration and development of oil and gas resources using balanced multiple-use management. BLM acknowledges that other human uses in the Region 4 have also contributed to the relatively high degree of direct and indirect impacts to natural landscapes in Region 4. Nonetheless, BLM has concluded that some changes to current oil and gas development practices are necessary. Refer to Chapter 2, Section 2.6 for a discussion of the rationale for selecting the elements of the Preferred Alternative.

GN12 *Appendix L, of the Draft SEIS, Hazardous Materials Summary, should make it clear that the levels of acrylamide used in the drilling process are less than the EPA maximum for potable water.*

Response: The referenced table was not constructed to compare the amounts of the materials used with EPA standards, but simply to list the materials that may be used in oil and gas drilling. However, your comment has been noted and will be included in our files for future reference on hazardous materials used in drilling.

GN13 *The SEIS contains no discussion of unitization and the possibility of making the unit development contingent on the acceptance of new lease stipulations as discussed in the SUWA/CEC Ruin Canyon IBLA case (127 IBLA 331, 374 (1993)).*

Response: The cited case makes reference to the possibility that BLM can condition the approval of a unit plan on acceptance by the lessees of certain standards. The BLM's policy, however, is that unit agreements will not prompt the review and/or modification of lease stipulations. A small portion of the leased area in Region 4 is unitized and there is a low probability of many more efforts to unitize in Region 4 in the future.

GN14 *The SEIS should have maps and acreage tables describing the areas covered by the various stipulations.*

Response: Maps describing the stipulated resources are dispersed throughout Chapter 3. Additionally, Appendix H contains resource area-wide maps describing the more extensive stipulated resources. Table 2.4-1 details the acreages covered under the Preferred Alternative by the types of stipulations.

GN15 *The SEIS should have addressed leasing decisions for the entire NOSR. This would have been the most practical and efficient way to achieve the Congressional directive of leasing the remainder of the NOSR as soon as possible.*

Response: The Congressional directive for leasing the NOSR included a one year timeframe for only the Production Area; other lands are to be leased as soon as practicable. Refer to Appendix C in the Draft SEIS for more information on Public Law 105-85.

Refer to Chapter 1, Section 1.1, for a brief history of the timing of events leading up to the Final SEIS. Note that the SEIS was initiated before PL 105-85 was passed. The BLM considered adding all the NOSR lands into the SEIS, but concluded that only the NOSR Production Area (primarily NOSR 3) could be included in the SEIS if the SEIS was to be completed in time to offer the leases consistent with the Congressional timeframes. This is due primarily to the fact that the resource values and resource issues vary tremendously between NOSR 1 and NOSR 3. BLM expects that public interest in BLM's management of oil and gas development on NOSR 1 will create much public interest; these lands have not already been leased, as is the case in most of Region 4, they have not already been developed for oil and gas resources, as is the case for NOSR 3, and they have not been subject to previous land use planning allocations, as have all other BLM-managed lands in the GSRA. Thus, BLM concluded that meeting the Congressional timeframes for leasing NOSR 3 would not have been possible if the NOSR 1 lands had been added to the SEIS at this time.

GN16 *The Maximum Protection Alternative should be strengthened by the following measures and then selected as the Preferred Alternative; No leasing in roadless and non-motorized lands, NSO in the entire riparian zone with no exceptions, NSO on all highly erosive soils and all slopes over 25 degrees with no exception, immediate inventory of all lands within the NOSR and a completed RMP prior to any leasing, consultation with the USFWS prior to leasing, and NSO an all botanically rich areas.*

Response: Support for the Maximum Protection Alternative and recommendations regarding specific elements of that alternative are noted. The SEIS is a supplement to an existing FEIS and as such is more limited in scope than the original FEIS. As discussed in the Draft SEIS, Section 2.1, the No Leasing Alternative was not considered in the SEIS because the FEIS affirmed the decision in the 1984 RMP that all lands except the Wilderness Study Areas would be available for oil and gas leasing. Refer to LP5 for additional information on the No Leasing Alternative.

Regarding stipulations for the Recreation Management Areas and Erosive Soils and/or Steep Slopes, refer to Chapter 2, Section 2.6 for a discussion of the rationale for selecting elements of the Preferred Alternative.

There is no requirement for inventories prior to leasing. However, about 4,000 acres of the NOSR Production Area have been inventoried for special status plants and animals. Additional inventories would be conducted prior to on-the-ground development activities. Refer to the Biological Inventories Lease Notice in the Preferred Alternative. Refer to Chapter 4, Section 4.15 for information concerning the supplemental wilderness inventory conducted by BLM on the NOSR Production Area. Additional wilderness inventories for NOSR 1 and the remaining portions of NOSR 3 above the rim would be conducted prior to leasing; no leasing outside the NOSR Production Area is proposed at this time.

The USFWS has been contacted regarding the SEIS. Refer to Appendix G. Threatened and endangered species are protected by federal law. BLM would initiate formal consultation with the USFWS, if necessary at a later stage, when area plans or Applications for Permit to Drill are being evaluated.

In addition, as described in Chapter 1, Section 1.5, the SEIS does not authorize any individual well locations. A separate environmental analysis (EA) would be conducted in the future for individual APDs. The EAs are site-specific and include, at a minimum, inventories for cultural resources and special status plants and animals.

Leasing Policy and Practice (LP)

LP1 *I object to the added leasing of government lands in Region 4 to private interests.*

Response: The opposition to leasing of public lands in Region 4 is noted. As noted in Chapter 1, Section 1.2, BLM is not proposing any changes to the major decisions in the 1991 FEIS, in particular that the entire GSRA mineral estate, except Wilderness Study Areas (WSAs) would be open for oil and gas leasing and development. With respect to Region 4, most of the area is already leased. The additional leasing that will occur on portions of the Naval Oil Shale Reserve was directed by Congress in Public Law 105-85 (Appendix C in the Draft SEIS). Even if Congress had not so directed, BLM, because of its multiple use mandate, would still consider making the area available for leasing.

LP2 ***I am strongly opposed to the BLM's proposed oil and gas leasing proposal for public lands in Eagle County because an inadequate analysis of impacts in these areas was done in the SEIS; leasing is contrary to the recreational character of these areas; and they haven't been properly inventoried for roadless and wilderness values.***

Response: The SEIS does not open up new lands for oil and gas leasing, rather it revises leasing stipulations on lands already available for leasing. Refer to Section 1.2 for a description of the purpose of the SEIS. Public lands in Eagle County have been open for leasing since the 1920's. The 1984 GSRA RMP evaluated the question of which lands to hold open and which lands to close to mineral leasing and concluded that all lands in the GSRA, with the exception of Wilderness Study Areas, be open for leasing. The FEIS accepted that determination. As a supplement to that document, there was no need to consider the No Leasing option in the SEIS.

Since the SEIS is a supplement to the 1991 FEIS, the analysis of impacts is more limited in scope than the FEIS. It was the determination of BLM that the RFD for Region 4 was substantially incorrect and that revisions in the RFD and the analysis of impacts in Region 4 were warranted in order to divulge those impacts and to improve BLM management of oil and gas activities. The RFD for areas outside Region 4 needed no upward revision since only one of the envisioned 18 wells for that area had been drilled. The principle reason for discussing Eagle County in the SEIS was to insure that the oil and gas leasing stipulations were consistent with new travel management designations made in the Castle Peak Travel Management Plan in 1997. The NSOs for Recreation Management Areas included in the Preferred Alternative, Section 2.4, would establish that agreement. Another reason to include lands outside Region 4 in the SEIS is to update leasing stipulations based on BLM's recent experiences with oil and gas management in Region 4. If stipulations from the SEIS were to apply only to Region 4, then all lands outside Region 4, including Eagle County, would continue to be available for leasing under the terms of the 1991 FEIS until modified by a subsequent planning effort and preparation of a separate RMP Amendment. Based on the minimal amount of oil and gas activity which has occurred to date outside Region 4 and the relatively low levels of future development assumed in the RFD, there would be little need for BLM to conduct such planning at this time. The earliest such planning might be contemplated is after 17 more wells are drilled outside Region 4. (The RFD calls for 18 wells to be drilled outside Region 4 over a 20 year period; since the FEIS, only one well has been drilled.)

LP3 ***Don't develop BLM lands until technology has advanced to a stage that allows oil and gas development without negatively impacting the environment and its inhabitants.***

Response: In accordance with the Mineral Leasing Act of 1920, it is BLM's policy to make federal lands available for oil and gas leasing and development. Environmental impacts are minimized through the use of appropriate lease stipulations and Conditions of Approval. In some relatively rare instances, lands may not be offered for lease because the impact on certain unusual natural values cannot be mitigated as, for example, in the case of Wilderness Study Areas. As drilling has occurred, the technology has improved, both for recovering the oil and gas reserves and for minimizing the impacts on surface resources. While technological advancements may make oil and gas drilling in the future more cost effective and efficient and enable production from some areas currently unavailable for oil and gas development, it is not likely that such advancements would preclude all degree of environmental impacts.

Moreover, it is not BLM's intent to avoid all impacts to the environment when developing oil and gas resources; such a goal is unrealistic. It is, however, BLM's goal to reduce environmental effects in a reasonable manner to find a balance between surface resource protection and development of subsurface resources and to avoid unacceptable impacts while contributing to the nation's current needs for natural gas. BLM has concluded that the mitigation measures contained in the Preferred Alternative provide the most appropriate balance of achieving resource protection while facilitating economic oil and gas development. Achieving such balance is a primary objective of the Draft SEIS. Refer to Chapter 2, Section 2.6 for a discussion of the rationale for selecting the elements of the Preferred Alternative.

LP4 ***The length of oil and gas leases should be limited to 10 years and made more provisional to allow BLM to adjust its management to changing conditions. (Ewing)***

Response: The Mineral Leasing Act provides that competitive leases be offered with a five year primary term and that non-competitive leases be offered for a ten year primary term. The lease is essentially a contract between the United States and the lease holder. The lease transfers a right to the lease holder to develop the oil and gas resources within the lease area, consistent with the terms and conditions of the lease. The Preferred Alternative describes lease stipulations which would be attached to the lease that further constrain oil and gas development activities. During the preparation of the Preferred Alternative, BLM explored the option of developing a stipulation that would enable BLM to retroactively adjust lease restrictions in the event future land use planning resulted in changes to leasing decisions. It is BLM policy by general practice that leases be offered with only those stipulations necessary to address known or anticipated resource conflicts. To include a stipulation that would enable the BLM to retroactively adjust lease restrictions would create uncertainty for future lease operations, possibly affecting exploration potential and development costs. Such uncertainty does not generally provide positive incentives for leasing. In addition, the lease stipulations included in the SEIS are based on in-depth analysis of resource values and environmental consequences. BLM believes that the Preferred Alternative contains sufficient protective measures and achieves a reasonable balance of surface and subsurface resources. As new information is obtained that might affect oil and gas leasing and as land use plans are updated in the future, oil and gas leasing stipulations would be revised as appropriate.

LP5 ***The SEIS is insufficient because BLM refused to recognize its discretionary authority to not lease and include a no leasing alternative.***

Response: Please refer to Response NP15.

LP6 ***Leasing of public land mineral resources should be delayed until such time as their is not a market glut of the resources.***

Response: In accordance with the Mineral Leasing Act of 1920, it is BLM's policy to make federal lands available for oil and gas leasing and development, independent of considerations of market conditions at the time of the lease. It takes years to develop a lease property. During that period of development, market conditions can change radically and often.

LP7 ***BLM has had oil and gas under lease in Eagle and Routt counties in the past. BLM's failure to make the minerals available is a deterrent to oil and gas exploration on adjacent private land.***

Response: Lands in Eagle and Routt County administered by the GSRA have been available for oil and gas leasing for many years. BLM acknowledges that leasing on approximately 4,200 acres of public lands acquired in 1992 in the King Mountain land exchange has been deferred pending completion of the SEIS. These lands will be available for leasing consistent with the stipulations described in the SEIS after the Record of Decision for the SEIS is approved.

LP8 *The BLM should provide a map of areas in Region Four that are already leased and those areas that are not yet leased.*

Response: As stated a number of times in the Draft SEIS (page 2-5), about 95 percent of Region 4 is already leased. A map displaying that fact would be of little value. The NOSR Production Area has not been leased and is clearly displayed on Map 1-3.

LP9 *The following areas should be off-limits to oil and gas leasing and development activities: riparian areas, mule deer habitat, elk and deer calving/breeding grounds, critical winter range, sage grouse habitat, old growth habitat, roadless areas within public lands and many other environmentally sensitive areas and areas of special interest.*

Response: Refer to GN16 and NP15. In addition, there are many tools available to the BLM, short of "no leasing," to provide appropriate consideration and protection of the values described by the reviewer. Refer to Chapter 2, Section 2.4, Preferred Alternative, for a listing of the many stipulations and lease notices designed to provide reasonable protection to a variety of resource values while facilitating orderly, economic and environmentally sound oil and gas exploration and development. Note the following specific elements of the Preferred Alternative: Riparian and Wetland Zones NSO and CSU; Timing Limitations for Big Game Habitat and Birthing Areas and Sage Grouse, and the NSO for the Recreation Management Areas. In addition, as described in Chapter 1, Section 1.5, the SEIS does not authorize any individual well locations. A separate environmental analysis (EA) would be conducted in the future for individual APDs. The EAs are site-specific and include appropriate inventories such as for cultural resources and special status plants and animals.

Lease Rights (LR)

LR1 *BLM has the authority to require much of what the Draft SEIS is now proposing would be voluntary; it seems BLM is relying heavily on voluntary compliance instead of asserting the authority granted in the standard lease terms.*

Response: BLM has interpreted these comments as an observation that, because of concerns about lease rights, BLM has been unwilling or unable to require of the operator measures included in the FEIS and, further, that many measures included in both the FEIS and the SEIS could not be implemented. BLM has reviewed the implementation status of each of the stipulations contained in the FEIS. A summary of this review was added to the Final SEIS, Chapter 2, Section 2.3. That review concludes that nearly all of the stipulations included in the FEIS have been implemented, at least in part, consistent with the FEIS. Refer to the Final SEIS, Chapter 2, Section 2.6, which discusses in general terms the elements of the Preferred Alternative relative to consistency or inconsistency with lease rights for leases with only standard terms and conditions.

LR2 *BLM needs to state what mitigation is consistent with lease rights and what mitigation is not consistent with lease rights.*

Response: Please refer to Response LR1. The question of consistency with lease rights is often a matter subject to interpretation that is heavily dependent on the details of a specific situation. As such, it is not possible to describe what mitigation is consistent with lease rights except in the broadest of terms.

LR3 *The Draft SEIS, p. iii, states that the Standard Lease Terms "constrains the ability of the BLM to require certain mitigation measures on APDs." This statement is not accurate. What has constrained the BLM's ability is an instructional memorandum (92-67) that established as state and national policy, the minimum authority of the lease right granted.*

Response: BLM Instruction Memorandum 92-67, dated December 3, 1991, provides guidance on application of new mitigation to permits issued without stipulations requiring the new mitigation. The memorandum provides guidance on the interpretation of 43 CFR Subpart 3101.1-2 which established the 200 meter/60-day rule. It is the lease itself, not 43 CFR 3101.1-2 or IM 92-67, which constrains BLM's management of oil and gas operations. Refer to Chapter 2, Section 2.3 for more information on lease rights.

LR4 *The Draft SEIS declares that "an analysis of the mitigation measures described in this SEIS for consistency with lease rights was* *not completed.." (p. iv, SEIS) If the potential to mitigate impacts through COAs on 95 percent of leased lands was not studied, then how can future impacts be ascertained? One would have expected to find a discussion of the environmental impacts that have occurred as a result of the mitigation from the 1991 FEIS not being available.*

Response: The complete quoted reference is, "An analysis of the mitigation measures described in this SEIS for consistency with lease rights was not completed because such an analysis is best conducted on a case-by-case basis so that site-specific factors can be considered." The statement makes the point that, while most impacts are mitigated by authority that BLM possesses independent of lease stipulations, the application of a particular COA could well depend on the specific situation in which it was to be applied. Chapter 2, Section 2.6, includes a general discussion of the consistency of each of the proposed mitigation measures with lease rights already granted as well as a discussion of the rationale for selection of the elements of the Preferred Alternative.

More importantly, the SEIS provides abundant information on Impacts to Date and the Future Impacts of oil and gas development in Chapter 4, Environmental Consequences. Since past oil and gas activities have been conducted mostly on lands leased prior to the FEIS, the Impacts to Date section describes the impacts of oil and gas development on leases with mostly standard lease terms.

Additionally, BLM compared the Impacts to Date with the projected impacts of the Standard Terms and Conditions Alternative in the FEIS. Refer to Chapter 4, Section 4.21, Environmental Consequences of Managing Oil and Gas Resources under Existing Leases. BLM has concluded that except in certain, relatively small impact zones in Region 4, the impact discussion in the FEIS for the Standard Lease Terms and Conditions Alternative appears to be unfounded. This is may be due to the fact that BLM and the operators in Region 4 have worked together to implement many of the measures of the FEIS, even on existing leases.

LR5 *The Draft SEIS gives the strong impression that the oil and gas industry is virtually unregulated by referring, on many occasions, to BLM's inability to place additional restrictions on existing leases. In fact, BLM has full authority to place restrictions on operations and has done so frequently in Region 4.*

Response: BLM agrees. While existing leases do indeed pose constraints on BLM's ability to require mitigation not considered consistent with lease rights, BLM does have wide-ranging authority to regulate oil and gas activity. Numerous requirements on oil and gas operations are implemented as Conditions of Approval. The standard lease terms provide BLM clear authority to conduct operations in a manner that minimizes adverse impacts to the land and a variety of natural resources. In addition, operators have been willing to work with BLM to achieve many of the goals described in the FEIS and BLM expects such cooperation will continue regarding the measures in the SEIS.

In response to this comment and others which reflect a misunderstanding of BLM's authority under standard lease terms and conditions, BLM has revised portions of Chapter 2 and amplified the discussion of the tools available to BLM for managing oil and gas development. See Chapter 2, Sections 2.2 and 2.3.

LR6 *Because of the geologic nature of Region 4, directional drilling is uneconomic. Use of the BLM 's standard authority to require moves of up to 200 meters to maintain 40 acre spacing is improper.*

Response: This comment reflects a concern with a statement in the Draft SEIS, Part 4.20.2.1, that densities greater than 40 acres would be reviewed on a case-by-case basis or in a Plan of Development to determine impacts, that many future well locations will likely be limited to existing 40 acre locations, and that additional densities would be drilled from existing wellpads. BLM agrees that directional drilling is more expensive than conventional drilling, though it has been utilized successfully in Region 4. Nonetheless, BLM would not limit surface occupancy to 40 acres solely to achieve 40 acre spacing, but rather to mitigate an identified, site-specific environmental effect. The statement in the SEIS is misleading in this regard. In fact, limiting density is only one of several methods to address environmental concerns. Nonetheless, BLM intends to utilize appropriate authority, including moving locations up to 200 meters, in order to reasonably address environmental effects.

NEPA Process (NP)

NP1 *The latest roadless review by the BLM constitutes "significant new information" and this requires a new EIS. (CEC)*

Response: The reviewer is incorrect. The availability of new information does not necessarily trigger a requirement to prepare an EIS. Nonetheless, BLM did consider the results of the latest roadless review in the SEIS. In fact, BLM compiled the information. The review was conducted by BLM in 1997 on approximately 3,700 acres adjacent to the Castle Peak WSA. These lands were included in the Conservationists' Wilderness Proposal. Refer to Chapter 3, Part 3.15 for more information on wilderness and the CWP.

NP2 *The analysis of the impacts of oil and gas development in the RMAs [and other roadless areas] is inadequate.*

Response: All the Recreation Management Areas are outside Region 4. As noted in Chapter 4, Section 4.11.2.4, oil and gas development would have negligible effect on recreation values outside Region 4, because the RFD, which serves as the basis for impact assessment, calls for limited exploratory drilling outside Region 4 (only 18 wells outside over a 20 year period).

It was the determination of BLM that the RFD for Region 4 was substantially incorrect and that revisions to the RFD and the analysis of impacts in Region 4 were warranted in order to divulge those impacts and to improve BLM management of oil and gas activities. The RFD for areas outside Region 4 needed no upward revision since only one of the envisioned 18 wells for that area had been drilled. Thus, there was no basis to revise the impact analysis of the FEIS for areas outside of Region 4. Refer to Chapter I, Section 1.3 and LP2 for information on why lands outside Region 4 were included in the SEIS.

It should be noted as well that, as described in Chapter 1, Section 1.5, the SEIS does not authorize any individual well locations. A separate environmental analysis (EA) would be conducted in the future for individual APDs. The EAs are site-specific and include a discussion of the impacts to resource values within the affected area. Any EA prepared for any oil and gas activities proposed in a Recreation Management Area would include an analysis of the impacts of oil and gas development on the non-motorized recreation values provided in the Recreation Management Areas.

NP3 *The SEIS omitted some of the NOSR lands that will be leased by BLM, the "S1/2 of Section 3 and all the NOSR lands in Section 10, T.6S, R. 94W, which do not contain any wells, but are part of the Contract Area of the Rulison Joint Operating Agreement. (DOE-NPOSR)*

Response: That omission was corrected in the Draft SEIS, Addendum, dated June, 1998 and in this Final SEIS. Map 1-3 displays the corrected boundary. The change in acreage figures is included in Table 1-1.

NP4 *The comment period on the Draft SEIS should be extended to allow citizens from parts of the GSRA outside of Region 4 to review and comment on the Draft.*

Response: The comment period for the Draft SEIS was extended for 60 days until November 23, 1998, in order to provide greater opportunity for the residents of the eastern portion of the GSRA to review the material.

NP5 *A public meeting should be held in Eagle County for the benefit of area residents.*

Response: As a result of the requests, a public meeting was held in Eagle County at the Gypsum Fire Protection District Building on November 4, 1998.

NP6 *The 'acreage only' analysis used to determine environmental consequences discounts the attributes of various land forms and the resultant habitat and species diversity.*

Response: The reviewer does not provide specific information concerning the inaccuracies of the analysis methodology used in the Draft SEIS to respond specifically but several general comments may be made. A region-wide analysis is, by its nature, general in its description of impacts. Calculation of the total acreage affected is often the best way to describe the region-wide impacts. In some cases, as with the description of certain wildlife habitat, such as wildlife seclusion areas, riparian zones or nesting and roosting sites, more specific descriptions can be made. Chapter 4 provides abundant information concerning such localized or habitat-specific impacts. BLM prepared information concerning the impacts of oil and gas development on the actual acreages of important habitats rather than try to predict impacts to a specific species of wildlife due to the difficulty of preparing such information on a region-wide basis. The scope of the habitat acreage affected provides a reasonable indication of the potential impacts to resources dependent on those habitats.

NP7 *The leasing of the NOSR should have entailed its own EIS, and should not have influenced a hasty evaluation of impacts as required by the FEIS with regard to oil and gas activities on existing leases.*

Response: The requirement that the NOSR Production Area be leased within one year of passage of

PL 105-85 did not influence a hasty evaluation of the impacts in the remainder of the GSRA. Discussion of the possible need to update the analysis and the decisions of the 1991 FEIS began as early as 1995. The Notice of Intent to develop a supplemental EIS was published in the Federal Register on April 21, 1997. By that time, the GSRA had already begin development of the Geographic Information System (GIS) data to be used in the analysis and had begun a plan for assessing and updating its oil and gas reclamation strategy. The inclusion of the NOSR Production Area in the analysis already was the most efficient and effective way to provide a NEPA process for the leasing of the lands in the NOSR Production Area. BLM's decision to extend the comment period for consideration of the impacts on air quality and to permit further review by GSRA residents underlines BLM's determination to give the SEIS process the amount of time necessary.

NP8 ***BLM should reissue the SEIS after giving equivalent analysis to non-Region 4 areas, thus meeting the requirements of NEPA.***

Response: Please see Response LP2. NEPA requires an analysis that is appropriate to the degree of impact anticipated. In the case of areas outside of Region 4,the RFD sets a level of future development that will not generate measurable impacts. Should it appear in the future that actual oil and gas development may begin to outstrip the RFD, a reassessment of this judgement will be made.

NP9 ***The SEIS contains no site specific analysis of the impact of increased oil and gas leasing on BLM lands contiguous to the Eagle Ranch.***

Response: Please see the response to NP2. Additionally, several points should be emphasized that are germane to the comment: 1) The analysis of impacts outside of Region 4 was largely the task of the COGEIS; 2) the impacts of motorized activities in the vicinity of the Eagle Ranch were addressed in the Castle Peak Travel Management Plan; 3) the RFD for portions of the GSRA outside of Region 4 would call for only negligible impacts at the most; 5) site-specific impacts are usually considered at the time an APD is submitted.

NP10 ***The SEIS fails to treat the issue of noise pollution.***

Response: Noise pollution was not specifically identified as an issue during scoping, although it is one of the many elements that figure into quality of life considerations. See Chapter 4, Section 4118. Note that Lease Notice 7 of the Preferred Alternative, Working in Residential Areas, calls for operators to develop procedures to accommodate impacts on nearby communities and residences. Concern over excessive noise is certainly an issue that would be addressed under this lease notice.

NP11 ***The SEIS fails to discuss pipeline transmission issues.***

Response: Pipelines for gathering natural gas from the wellhead and delivering it to distribution pipelines are addressed. They are among the potentially surface disturbing activities that generate so much of the impact of oil and gas development. As noted several times in the document, they are usually buried in the developed access road, or laid above ground to minimize the additional impact. Large sale gathering pipelines were beyond the scope of this supplemental document. The 1984 RMP designated areas as unsuitable or sensitive for utility facilities. Large scale pipeline systems that cross federal lands always require an environmental assessment and, most often, an EIS.

NP12 ***The SEIS fails to present the foreseeable impacts from residential development on private lands.***

Response: References to past and future impacts created by residential development in Region 4 are frequent. The cumulative impact sections of the riparian, wildlife and visual analyses make explicit the point that much of the impact on those resources to date, and many anticipated future impacts, are the result of a variety of human activities, including "housing development," "subdivision development,: and conversion of "agricultural and other lands into residential uses." Please see Chapter 4, Sections 4.31, 4.33, 4.5.3.2, 4.5.5, and 4.12.3.

NP13 ***The regulations, 36 CFR Part 228, implementing the 1987 Federal Onshore Oil and Gas Leasing Reform Act (FOOGLRA), must be strictly adhered to.***

Response: The regulations at 36 CFR 228 are only applicable on lands administered by the U.S. Forest Service. BLM's oil and gas leasing and operating regulations were established prior to FOOGLRA, which did not necessitate any change in those regulations. Those regulations are found at 43 CFR 3100.

NP14 ***We feel that variances in the potential impacts between the Proposed Action and the Continuation of Current Management Alternative do not meet the significance requirements of NEPA.***

Response: The determination of significance as required by NEPA relies on considerations of both the context and the intensity of the impacts of the proposed action. In the case of oil and gas drilling, individual wells rarely generate impacts that are judged to be significant. However, the cumulative effect of oil and gas development in an area that is also undergoing the effects of rapid population growth may well be significant. In general terms, it is BLM's assessment that natural landscapes within Region 4 have been and continue to be substantially affected by all manner of human activity, including oil and gas development. The selection of the elements of the Preferred Alternative was guided by this assessment and a continued adherence to the principal of multiple-resource management.

NP15 ***Oil and gas leasing is discretionary. The Minerals Leasing Act does not constrain BLM from considering a no leasing alternative. The SEIS is inadequate because it failed to consider a no leasing alternative.***

Response: BLM agrees that oil and gas leasing is discretionary. BLM also agrees that the Minerals Leasing Act does not constrain BLM from considering the "no leasing" alternative. The decision not to include the "no leasing" alternative in the SEIS was based on several factors, most notably that the Decision Record for the FEIS had already established that all lands except the Wilderness Study Areas would be available for oil and gas leasing. The SEIS is a supplement to the 1991 FEIS and is more limited in scope than the FEIS.

During the initial scoping period for the SEIS, little public comment was received regarding the range of alternatives. However, during the comment period on the Draft SEIS, several comments were received questioning the range of the alternatives in the SEIS. Most concerns in this regard were specific to the SRMAs and the Non-motorized Recreation Management Areas. BLM acknowledges that some reviewers disagree with the decisions of the FEIS and prefer that BLM consider a "no leasing" alternative for these specific areas. However, evaluating a "no leasing" alternative at this time would be outside the scope of the SEIS and inconsistent with the decisions contained in the FEIS.

NP16 ***Nowhere in the SEIS is mention made of significance.***

Response: Please see Response NP14. The reviewer should note that issues of significance are rarely straightforward propositions of exceeding a simple threshold. The fact that BLM pursued the course of an environmental impact statement for the 1991 Colorado Oil and Gas RMP amendment (the FEIS) can be attributed to the general understanding that oil and gas development issues may be of significant importance or highly controversial in nature. In the case of the SEIS, BLM's first concern was to establish through analysis the amount and the degree of impact that has occurred and that may occur in the future. Chapter 2, Section 26, Rationale for the Preferred Alternative, discusses those elements of the SEIS analysis that indicated a change management was in order.

NP17 ***Why is the part of the NOSR north of the Production Area included in the affected environment discussion, since it is not formally included in the analysis? Will stipulations from this document set a precedent for the lands in the NOSR north of the Production Area?***

Response: The NOSR lands north of the NOSR Production Area were transferred to the BLM by PL 105-85 in November, 1997 and became part of the GSRA at that time. Since the SEIS covered all lands in the GSRA, these lands were included in the SEIS, though no leasing decisions are proposed for those lands at this time. Chapter 1, Section 1.3 notes that NOSR lands north of the NOSR Production Area (mostly NOSR 1) will be included in the SEIS for many acreage calculations and for descriptive purposes. None of the measures included in the Preferred Alternative would apply to the remaining NOSR lands unless adopted in subsequent planning decisions.

NP18 ***Prior to opening up roadless and non-motorized lands to oil and gas development, GSRA should prepare a separate EIS which addresses impact on these areas.***

Response: The SEIS does not open up new lands for leasing, rather it revises leasing stipulations on lands already available for oil and gas leasing. Refer to Chapter 1, Section 1.2 for a description of the purpose of the SEIS.

In preparing a response to this comment, BLM assumes the roadless and non-motorized values mentioned by the reviewer refer most directly to characteristics associated with wilderness and potential wilderness designations. BLM conducted wilderness inventories for lands in the GSRA prior to 1984 and designated Wilderness Study Areas (WSA) at that time. In addition, the BLM completed a supplemental wilderness inventory for the NOSR Production Area in October, 1998 and a roadless review for approximately 3,700 acres adjacent to the Castle Peak WSA and included in the Conservationists'

Wilderness Proposal. Refer to Chapter 3, Section 3.15 and Chapter 4, Section 4.15, for more information on wilderness and the Conservationists' Wilderness Proposal.

Current BLM policy regarding discretionary actions, like oil and gas leasing, within areas included in the Conservationists' Wilderness Proposal, is established in IM CO-97-044, dated May 19, 1997. The policy holds discretionary actions in abeyance until the wilderness issues are addressed and resolved through the BLM planning process.

The SEIS supplements the FEIS regarding oil and gas leasing decisions, but does not actually convey any lease rights. Lease rights are conveyed at the time the lease is issued. Thus, IM CO-97-044 does not require that wilderness issues be addressed at this time. BLM chose not to conduct the in-depth review as described in IM CO-97-044 at this time because: (1) the areas included in the CWP are outside Region 4; (2) there appears to be only low to moderate potential for oil and gas development in these areas; (3) there are no current requests for BLM to lease such areas, and none are anticipated in the near term, and (4) the reviews require allocation of scarce resources that are currently unavailable. In the event a leasing proposal for areas included in the CWP is received in the future, IM CO-97-044 would apply.

It should be noted that WSAs are not available for leasing. Also, all lands currently managed by BLM for non-motorized recreation have been included in the SEIS and are subject to a variety of protective measures to minimize impacts of oil and gas development on those non-motorized recreation opportunities. Refer to Chapter 2, Section 2.4 for a description of the Preferred Alternative and measures associated with SRMAs, ACECs and Recreation Management Areas.

Operations Management (OM)

OM1 *Garfield County "requests that the oil and gas operator upgrade roads which will receive scheduled trips by oil and gas equipment to the standards for such weights and frequency of use. The County requests that the operator maintain all other road structures to, at a minimum, their current condition and that the operator immediately repair any and all damage to county roads as a result of degradation from oil and gas equipment. The county requests that a road improvement and maintenance plan be developed for County review prior to oil and gas equipment operations."*

Response: BLM discloses potential impacts but does not require mitigation of impacts on lands or roads outside of public lands. The authority for regulating and maintaining county roads is with the county and not BLM. All oil and gas permitees ar required to comply with applicable county regulations.

OM2 *Drilling should not be allowed until adequate surveys are done to determine what natural values are present.*

Response:. BLM agrees. As described in Chapter 2, Section 2.2, BLM does not approve an APD until all necessary surveys and site-specific evaluations are completed. Surveys are conducted for special status species, cultural and paleontological resources as needed. Avoidance or other mitigation is then developed depending on the resource in question and the specifics of each individual site. In addition, the habitat types and vegetative species involved at the site are ascertained. Seed mixes are tailored to take this information into account.

Field surveys for special status plants were conducted on approximately 4,500 acres of the newest area to be leased, the NOSR Production Area, given the high likelihood that special status plants might occur there. The results of that survey data will be incorporated into appropriate lease stipulations and COAs.

OM3 *We need regulation that keeps well drilling at least 1000 ft. from churches, schools, businesses, or residences.*

Response: It is not the intent of the SEIS to adopt regulations, but rather to identify lease stipulations to be attached to new leases and standard operating procedures or best management practices to manage oil and gas operations on existing leases. Refer to Chapter 1, Part 1.2 for more information on the purpose and need of the SEIS. Also, most instances of oil and gas development in the vicinity of churches, schools, businesses, or residences occur on private land, outside the scope and authority of BLM management of oil and gas activities.

BLM agrees that oil and gas activities in the close proximity to churches, schools, businesses, or residences are often incompatible with such uses, though the degree of incompatibility is often dependent on the perspective of the affected citizen. Refer to Chapter 4, Part 4.18 regarding the impacts of oil and gas development on quality of life considerations.

Regarding a reasonable buffer between oil and gas activities and churches, schools, businesses, or residences, such a buffer is best determined based on a site-specific examination. A reasonable buffer to one citizen is likely to be too short for some and excessive to others. Generally, BLM feels that authority to move a well up to 200 meters will be sufficient to minimize conflicts between BLM-managed oil and gas activities and other uses of nearby private lands. Also note that the Preferred Alternative includes a Working in Residential Areas Lease Notice that requires operators to address concerns with oil and gas development in residential areas.

OM4 ***Operators should be required to submit a comprehensive drilling plan for any area that they intend to drill before a drilling permit is issued.***

Response: BLM agrees that examining oil and gas operations in a more comprehensive manner is necessary to evaluate certain environmental effects and be responsive to public concerns. Chapter 2, Section 2.7, includes new information regarding BLM's management protocol for existing leases. In order to maximize BLM's ability to achieve the mitigation measures described in the Preferred Alternative, consistent with lease rights already granted, BLM would require that the operator submit a geographic area proposal that describes near-term future activity for operator-controlled federal leases with a reasonable geographic area.

OM5 ***Drilling should be held to forty acre spacing and any further well downsizing should be held to directional drilling off the main well site.***

Response: Support for limitations on well densities is noted. Refer to Response LR6. A description of directional drilling is given in Appendix A of the Draft SEIS. A thorough discussion of directional drilling was not included since BLM does not have authority to require directional drilling. After an APD is submitted, an on-site inspection is conducted. During this inspection, any resource conflicts (including visual) are identified. If the resource conflicts identified can be mitigated, the Auhorized Officer will approve the APD with appropriate COAs. If the resource conflicts cannot be mitigated, BLM may require that the well or road location be moved. The distance BLM would move a well location is dependent upon the on-site analysis and the stipulations attached to the lease. As an alternative to moving the well, the operator may choose to directional drill from another location. After finding an acceptable well location, the decision to use directional drilling then lies with the operator. If the operator feels that directional drilling is economical well, then the operator will proceed. In conclusion, BLM cannot require a company to directionally drill; that decision rests with the operator. BLM's responsibility is to approve a location that provides adequate protection to the other resources.

OM6 ***The overall disturbance to the surface will be devastating unless BLM places controls on the spacing of wells. BLM should exercise the Section 4 authority of the standard lease terms to specify rates of oil and gas development.***

Response: Section 4 of the standard lease form refers specifically to downhole reservoir management, to the diligence, rate of development, unitization and drainage of "leased resources," in this case the natural gas. Specifying the rate of development and production is sometimes necessary to protect a reservoir from damage or waste. This section is not used to specify a rate of development based on surface resources. Section 6 of the standard lease terms refers to protection of surface resources and rights.

OM7 ***Operators should be required to pipe produced water to a common disposal pond to minimize truck traffic.***

Response: There are a number of difficulties with the concept of piping produced water to a common disposal pond. Piping produced water can result in operational problems such as freezing and broken lines. Such occurrences may cause excessive shut-in periods for wells during the winter months when demand for natural gas is highest. Moreover, the distance from some wells to the approved disposal ponds would make operation of the wells uneconomical resulting in lost royalties. Perhaps most importantly, requiring additional pipelines would also result in additional surface disturbance which could increase the environmental impacts.

OM8 ***BLM should require a 100-150' seal above and below encountered water zones since the Rulison area is so highly fractured.***

Response: Operators are required to isolate all usable water zones encountered by cementing across the zone. The minimum requirement is to cement from 50 feet above to 50 feet below each usable water zone encountered. This requirement can be increased as needed, but based on BLM's knowledge of the area in which oil and gas production is occurring, the 50 foot minimum is adequate to protect the water zones.

OM9 *Directional drilling is a technology that is improving. BLM should consider this option prior to permitting drilling, especially in sensitive view corridors.*

Response: Please see Response OM5. BLM agrees that directional drilling is one of several options available to the operator to address environmental concerns. However, due to the costs of directional drilling and the technological and geological limitation on the use of directional drilling, it cannot be assumed that directional drilling will work on every site. Such an option is best addressed in a site-specific environmental analysis prepared for a specific well or group of wells so that the economic implications and the feasibility of directional drilling can be discussed relative to the site-specific values of concern.

Note that BLM's management of visual impacts under the terms of the Preferred Alternative might include requiring a relocation of the proposed well site. The NSO on the Interstate 70 viewshed and the CSU on all VRM Class II areas each could entail moving the site more than 200 meters.

OM10 *Barrett objects to the submittal of Plans of Development for the location of future wells. The real world of geologic interpretation, reservoir analysis, return on investment, etc. prevents such long-range planning.*

Response: BLM agrees that geologic interpretation, reservoir analysis, return on investment, and other factors affect the operator's ability to conduct long range planning. Nonetheless, BLM has concluded that some measure of comprehensive planning is necessary to address certain public issues and concerns, to adequately analyze certain environmental impacts and in order to maximize BLM's ability to achieve the mitigation measures described in the Preferred Alternative consistent with lease rights already granted. Therefore, the Final SEIS, Chapter 2, Section 2.7, includes new information regarding BLM's management protocol for existing leases. BLM would require that the operator submit a geographic area proposal that describes near-term future activity for operator-controlled federal leases within a reasonable geographic area. Given the uncertain influence of the factors mentioned by the reviewer, BLM has attempted to describe a process for more comprehensive planning that provides the operator with the flexibility needed, given their planning uncertainties but which would still enable BLM to conduct the necessary environmental analysis.

Reasonable Foreseeable Development (RD)

RD1 *I am concerned by the scale of oil and gas leasing that is proposed...with a possible total of 300 wells in the area.*

Response: The future well numbers referred to in the SEIS are from the Reasonable Foreseeable Development (RFD) scenario, which is described in Chapter 4, Section 4.1 of the Draft SEIS. The RFD is not a proposal for oil and gas development but one of a number of possible scenarios that portray future activity in the area. The RFD is used for analysis purposes, to gauge the degree of impact that would be expected to occur over the next 20 years. It assumes that by the year 2018, 1,200 new wells would be developed in Region 4, 300 of them on federal mineral estate managed by BLM. Of the 300 federal wells, 70 would be in the NOSR Production Area. For parts of the GSRA outside of Region 4, the RFD remained as it was in the FEIS, 18 wells on federal mineral estate. The actual number of wells drilled over the next 20 years will depend on the lease holders' responses to a number of physical, technological, financial and market conditions.

RD2 *The RFD in the SEIS understates the levels of drilling activity. The average level of activity over the last five years does not include full commercial development of the NOSR properties, particularly since spacing densities have increased, gas prices have risen considerably and a purely 'defensive' development strategy based on resource protection goals was utilized.*

Response: The RFD for Region 4, 1200 wells on federal and fee mineral estate, reflects an average level of drilling over the next 20 years with periodic lulls and spurts in activity, depending on a number of external factors, the demand for natural gas, the price, technological innovations, etc. The availability of the natural gas reserves of the NOSR Production Area is one of those factors that may influence the rate of development and will certainly influence the amount of gas that will eventually be produced from the area's reserves. The availability of the NOSR Production Area reserves affected the RFD in that the portion of total development that comes from the federal mineral estate was increased from about 20 percent to 25 percent. Had the NOSR reserves not been made available, the RFD would have remained at 1,200 wells over 20 years, but the federal mineral share would probably have been 240 or 250 wells instead of 300 wells. It should be noted that, in the short time since publication of the Draft SEIS, the price of gas has fallen and the rate of drilling has dropped as well. Additionally, the reviewer should be aware that the RFD was established prior to the development of the mitigation alternatives considered in the Draft.

RD3 *The assumption of the SEIS that only 70 of the BLM wells will be located in the NOSR Production Area shortchanges the value of this property. Analysis by the DOE-NPOSR shows that 272 wells could be commercially successful, although only 115 would be 100 percent federal.*

Response: BLM agrees that the tremendous potential of natural gas in the NOSR production area would support considerably more than the 70 wells indicated in the RFD. That number is not meant to represent the total oil and gas potential of the NOSR reserves offered for lease, only the share of the assumed RFD that might be located there in the next 20 years.

RD4 *The COGCC staff provided information regarding historic natural gas well permitting and production levels, production and price forecasting for future wells, an inventory of surface disturbance and reclamation on non-federal land in Region 4, surface casing requirements in Region 4 and a research summary regarding Project Rulison. After a review of the Draft SEIS, we believe that this information has been accurately and reasonably applied. COGCC agrees with the forecast level of natural gas well drilling activity for Region 4 outlined in the Reasonable Development Scenario.*

Response: The COGCC made many valuable contributions to the SEIS. Together with the operators drilling in Region 4, their consultation on potential future drilling activity was an important element in the selection of an RFD.

RD5 *The SEIS does not appear to take into consideration the current spacing that will be used on public lands.*

Response: Several recent decisions of the COGCC reduced well spacing to 40 acres, and in some cases, 20 acres, in parts of the GSRA. These changes were not considered directly in the development of the RFD but did influence the assumptions the RFD is based on. Two of the principle assumptions made in the RFD process are that the annual level of development activity over the next 20 years would be similar to that which has occurred in the last 5 years and that future development would be most likely to occur in and near areas that already have been developed. Both of these assumptions require that well density in parts of Region 4 would increase. In other words, the reduced spacing authorized by the COGCC would have to occur to allow continued development in Region 4. The RFD does not imply that Region 4 in its entirety would be developed on a 40 acre or 20 acre basis.

RD6 *There is little likelihood of oil and gas development in the eastern part of the GSRA. The only possible formations for the development of coal bed methane are the Cretaceous Mesa Verde and the Tertiary Wasatch formation which do not occur in that area.*

Response: The reviewer's assessment agrees with BLM's evaluation of the natural gas development potential in areas outside of Region 4.

RD7 *It is irresponsible for BLM to rely on a low probability of exploratory oil and gas activity in the recreation areas of Eagle County.*

Response: BLM is not relying on the low probability of development for the protection of the many valuable resources in Eagle County. The lease stipulations described in the SEIS are based on impacts associated with a relatively high rate of development in Region 4 and the value of the affected resources. For example, BLM's Castle Peak Travel Management Plan determined that a number of public land areas in Eagle County should be managed for non-motorized recreation opportunities. The NSO stipulations for these areas in the Preferred Alternative are an effort to make the oil and gas leasing decisions consistent with the travel designations. Refer to LP2 for more information on why lands outside Region 4 were included in the SEIS.

It is fair to say, however, that the low likelihood of development in areas outside Region 4 led BLM to assume, incorrectly, that there was little interest in these issues in Eagle County.

RD8 *BLM's assumption that no major technological innovations are imminent in the oil and gas industry is in error and therefore the RFD is in error.*

Response: The reviewer's comment underlines the contingent nature of the RFD. To the extent that conditions laid out in the RFD assumptions do not occur, then the RFD will have been proven to be inaccurate. Extended periods of low prices, a new energy crisis, and technology breakthroughs are some of the many variables that could make the actual development differ from the RFD. However, the RFD is *reasonable* in that it provides BLM's best current understanding of the potential future of drilling activity in both Region 4 and outside Region 4. Such an understanding is necessary to reasonably describe environmental effects.

RD9 ***BLM should review the RFD regularly to make sure it is still accurate. If the review indicates that the level of activity has changed, then additional NEPA analysis should be conducted before any more leases are issued.***

Response: BLM's review of oil and gas development activity is ongoing. Should actual development in the future indicate that the RFD used in the SEIS was low, and thus that the assessment of impacts was incorrect, a new impact assessment in all or parts of the GSRA may be warranted.

RD10 ***The level of oil and gas development in the RFD is overstated. It would be more reasonable to project the current activity for a few years into the future followed by a marked decline in the rate of drilling. In fact, Barrett sees no activity beyond ten years under current conditions.***

Response: A fundamental assumption of the RFD is that development in Region 4 would continue over the next 20 years at or near the level that has occurred in the recent past. While the RFD was being developed, the COGCC and leaseholders in Region 4 were consulted on that and other assumptions. At that time, there appeared to be no disagreement with the concept of continued development over the next 20 years.

Reclamation (RL)

RL1 ***The BLM should set specific standards for reclamation, including seed mixtures that can thrive and feed wildlife, begin reclamation in the first growing season after soil disturbance, require fencing and irrigation of reclaimed areas, require weed control, and not release bonds until compliance has been achieved.***

Response: Appendix I of the Draft SEIS provides a thorough description of the GSRA's management of oil and gas reclamation, including a summary status of reclamation at each wellpad that has occurred to date and a copy of the GSRA's reclamation policy. One of the basic goals of that policy is to "establish desirable (seeded and native) vegetation to set the stage for natural processes to restore the site." All of the requirements suggested by the reviewer are, in fact, tools that BLM has at its disposal when managing reclamation of developed well sites.

RL2 ***BLM needs to improve how they measure the success of revegetation of disturbed sites. The summary and reclamation status information presented in Appendix I is very suspect because of the methodology the BLM is using to assess vegetative response. The methodology is not representative and the sample size is too small to definitively assess anything.***

Response: Success of reclamation is based on assessment of entire pads/roads/pipelines, not on a scientific sample of a pad or other facility. On uniform, homogeneous sites such as the flat topography of Southwestern Wyoming, random transects may provide a valid assessment of the reclamation status of the entire facility. Given the topographic relief in this area, pads are generally quite heterogeneous, i.e., there is typically a cut-and-fill slope as well as the level pad surface and a reclaimed reserve pit. Each of these situations usually produces different vegetation density and composition and potential for erosion. The number of transects required to perform a statistically valid sample would potentially be huge.

The variability of the site would not be accurately measured via a small series of transects. Small inclusions such as a bare spot or a weedy patch or the beginnings of a gully could easily be missed by a random transect.

Hence, the BLM feels it is preferable to use a trained observer to assess the entire site to determine not just overall status of revegetation, but also to identify and document where problems areas may occur, such as patches of bare ground, a weed infestation, rills and gullies. Often the outcome of the reclamation monitoring will earmark portions of a pad that need retreatment rather than the entire pad. The reclamation monitoring includes a diagram of the well pad and locations of specific problems areas and corresponding notations are drawn on the diagram.

Finally, the objective of the review is to facilitate timely adjustments to the reclamation plan or prescribe corrective measures to address identified findings. BLM has determined that the prescribed methodology best meets these objectives and has determined that additional, more detailed sampling is unnecessary.

RL3 *The oil and gas roads and wellpads do not appear to be properly engineered and this results in poor reclamation and excessive erosion.*

Response: The reviewer provides no site-specific information to validate these observations. BLM agrees that proper engineering and design of roads and wellpads is critical to achieving the outcomes described in the GSRA Reclamation Policy. However, with few exceptions, BLM is satisfied with the location and design of current oil and gas facilities on BLM land. Nonetheless, improvements can always be made and BLM will continue to work with the operator to improve design and construction techniques. A very thorough analysis of reclamation status is provided in Appendix I of the Draft SEIS. Overall, BLM has concluded that reclamation on 6 percent of the total area affected by oil and gas development is unacceptable, 48 percent is at risk and requires monitoring, 24 percent is acceptable and 21 percent is complete.

RL4 *Section 4.3, Vegetation, contains no discussion of the impact of noxious weeds.*

Response: The reviewer is correct. The SEIS describes the environmental effects of oil and gas development on vegetation, but focuses on riparian and wetland vegetation. Noxious weeds are a growing problem in thirteen western states. Any action which disturbs the ground could potentially lead to the spread of noxious weeds. Therefore, oil and gas operators are required to control noxious weeds on and along roads, pipelines and wellpads. Refer to the GSRA Reclamation Policy in Appendix I of the Draft SEIS which include an objective that "no noxious weeds are present" and Appendix D in the Final SEIS which includes a commonly used COA that prescribes specific reclamation objectives to minimize the presence of noxious weeds. In 1991, BLM approved a Record of Decision (ROD) for Vegetation Treatment on BLM lands. The ROD was derived from an Environmental Impact Statement (EIS). That EIS discussed noxious weeds in detail. Please contact the GSRA office for more information on this EIS and noxious weeds.

RL5 *Well site 58-19 is an example of BLM's failure to enforce its own reclamation standards. It was only after years of complaints and a letter from the CDOW (July 23, 1996) that any effort was made to rectify a long-standing problem with the wellpad and the road to it. The problems remain today. This situation is typical of the development on BLM lands in the Parachute Creek drainage. Parachute Creek and tributary drainages are being degraded by oil and gas activity to the point where they cannot provide clean water or healthy habitat for wildlife. Oily residues can be seen along the drainages.*

Response: BLM acknowledges reclamation problems at well 58-19 and continues to work with the operator to improve reclamation at the site. However, BLM does not agree that well 58-19 is typical of the development in the Parachute Creek drainage. Refer to the Draft SEIS, Appendix I, for a specific assessment of the reclamation success on BLM wells throughout Region 4, including the federal wells in the Parachute Creek drainage. Though the data is not segregated into specific watersheds, the overall results of the assessment (refer to RL3) would likely be consistent for wells in the Parachute Creek drainage.

BLM also disagrees with the reviewer's conclusion that these drainages are degraded to the point that they cannot provide clean water or healthy habitat for wildlife. BLM conducted site visits to the drainages in question on September 23 and 24, 1998, to make some general observations. BLM personnel noted that no oily residue was seen along the Crawford Gulch, Riley Gulch and Starkey Gulch drainages even though wells were being drilled at the time of the visit and numerous producing wells are located in these drainages. Crawford Gulch was dry at the bottom road crossing during the inspection. There were also approximately 20 minnows observed in Starkey Gulch at the road crossings.

Riley Gulch, Starkey Gulch and Crawford Gulch look the same as other streams in the general area with similar topography and soils but with no oil and gas activity. Conductivity levels measured during the visit were 1,580 micromhos at Riley Gulch and 920 micromhos at Starkey Gulch. Both of these readings were taken at the lowest road crossing below all oil and gas development taking place on public land. The conductivity measurements are also within the range of conductivity measurements on these other streams. The levels measured would not indicate pollutants are present that would constitute a threat to wildlife. While these observation and measurements do not represent an in-depth analysis of water quality, they do provide an indication that the water is clean.

RL6 *BLM's bonding requirements are inadequate to insure the eventual reclamation of difficult sites.*

Response: BLM's assessment is that the current bonds by the operators within the GSRA are adequate.

BLM has not had any defaults on the bonds in place. In accordance with 43 CFR 3104.5, BLM may increase the amount of a bond if it is determined necessary. Also, in accordance with 43 CFR 3104.7, BLM may cancel the leases of an operator that defaults on a bond. BLM has not seen the need to increase any bonds in this resource area.

A nationwide evaluation of the current BLM bonding system recently determined that the federal government was at some risk with the current lease and statewide bond amounts. As a result, a proposed rule has been issued which will increase the amount of a lease bond and a statewide bond. The proposed rule would require an increase from $10,000 to $20,000 for a lease bond, and an increase from $25,000 to $75,000 for a statewide bond. The evaluation showed very little risk associated with nationwide bond, and therefore the nationwide bond amount will not be increased and will remain at $150,000.

Recreation/Wilderness (RC)

RC1 *There should be no exceptions to the proposed NSOs in Eagle County because the non-motorized designations from the Castle Peak Travel Management Plan established the essential recreational character of those areas and oil and gas development activity is incompatible with that character.*

Response: Support for the Maximum Protection Alternative for Recreation Management Areas within the Castle Peak Travel Management Plan area is noted. BLM agrees that oil and gas activities would most likely be inconsistent with non-motorized recreation values. Thus, the Preferred Alternative provides for no exceptions in the Castle Peak and Bull Gulch Recreation Management Areas and only limited exceptions in the Pisgah Mountain Recreation Management Area. Refer to Chapter 2, Section 2.4, for a description of the Preferred Alternative.

RC2 *The proposal for the non-motorized and roadless areas is too vague. How do you define "existing roads"? How far off the road could a well be sited? Would seasonal closures still be in effect?*

Response: BLM agrees that the exceptions described for the Non-motorized Recreation Areas NSO in the Proposed Action are vague. Though the Preferred Alternative provides for no exceptions for most of the Recreation Management Areas, exceptions for the King Creek and Pisgah Mountain Recreation Management Areas are still available and are defined more clearly in Chapter 2, Section 2.4.

RC3 *The closure order for the King Mountain area made it clear that only "administrative" uses of roads were permitted. BLM must honor the order by denying oil and gas use of the roads.*

Response: BLM agrees that the "Temporary Use Restrictions for the King Mountain Area of Colorado" of June 4, 1993 did not specifically exempt motorized vehicle access for oil and gas development. However, one exemption does provide for persons or agencies holding a valid easement or special use permit or right of way to use motor vehicles in the restricted area for access to and maintenance of authorized facilities, provided such motorized use is limited to the routes specifically identified in the special use permit or right of way. It was the purpose of this exemption to accommodate adjacent landowners with easements in the restricted area as well as those with valid permits issued by the BLM, including an approved Application for Permit to Drill (APD). Under the Continuation of Current Management Alternative, if an APD was approved it would describe the roads available for use by the oil and gas operator.

Additionally, the travel order only revised the Off Highway Use (OHV) designations for the area and did not revise previous decisions in the GSRA RMP; namely that all lands in the GSRA, except Wilderness Study Areas, would be available for oil and gas leasing. It was not the intent of the travel order to revise any decisions of the GSRA RMP other than OHV restrictions. Moreover, the Environmental Assessment prepared for the King Mountain land exchange, dated July 31, 1992, contained an Appendix D, Conceptual King Mountain Management Strategy. Appendix D described BLM's intent for the newly acquired lands and stated "mineral leasing, primarily for oil and gas, would continue subject to the appropriate lease stipulations and conditions of approval identified in the ROD for the 1991 FEIS."

Nonetheless, BLM has determined that oil and gas development activities on King Mountain and the other Recreation Management Areas would most likely be inconsistent with the non-motorized recreation opportunities provided in such areas. Therefore, the Preferred Alternative includes a Recreation Management Areas NSO, with no exceptions, for most of the King Mountain Area. Some exceptions are available for approximately 840 acres on the north side of the King Mountain Area, referred to as the King

Creek Area. Refer to Chapter 2, Section 2.4, for more information on the Recreation Management Areas NSO and the exceptions for the King Creek Area.

RC4 *I am opposed to the use of any existing roads on King Mountain or Castle Peak for vehicle use to explore or drill for oil and gas or search for minerals. This goes against BLM's commitment at a public meeting on the Visintainer land trade that King Mountain would remain a motorless area.*

Response: Refer to RC1 and RC3.

RC5 *What buffer areas are included in the NSO's for the Castle Peak and Bull Gulch WSAs and the Eagle county recreation areas? Such buffer areas are a necessity for roadless areas.*

Response: The reviewer provides no rationale for buffers around WSAs and Recreation Management Areas. BLM WSAs are unavailable for oil and gas leasing and the SEIS proposes no changes to this status. Activities outside the WSAs will not affect the status of the WSAs, thus no buffers are needed. The SEIS does propose substantial new protective measures for several Recreation Management Areas throughout the GSRA as well as the WSAs in the event Congress were to release the areas for management of non-wilderness uses. Refer to Chapter 2, Section 2.6, for a discussion of the rationale for selecting the NSOs proposed in the Preferred Alternative for the Recreation Management Areas. BLM has determined that the NSOs provide sufficient protection to the non-motorized recreation values in the Recreation Management Areas. Thus, providing a buffer around these areas would be unnecessary.

RC6 *The proposal for the recreation areas shows that BLM is disregarding multiple use and favoring recreation.*

Response: Multiple use, including recreation, continues to be a mission of the BLM. As stated in Chapter 2, Section 2.5.2, two of the objectives of the Proposed Action are "to provide a reasonable balance between surface and subsurface resources" and "acknowledge BLM's multiple-use mandate." However, BLM acknowledges that finding the appropriate balance is very complex and many reviewers offer varying perspectives on the reasonableness of the balance provided by the Proposed Action. Refer to Chapter 2, Section 2.6 for information concerning the rationale for the Preferred Alternative.

RC7 *Map 3.11-1 does not accurately portray the Bull Gulch SRMA.*

Response: The scale of the maps displayed in the Draft SEIS makes it difficult to display some of the complexities of resource and administrative boundaries. The reviewer probably refers to the fact that the Bull Gulch SRMA is not synonymous with the Bull Gulch WSA and, further, that the Bull Gulch Recreation Management Area (RMA) surrounds the Bull Gulch SRMA. Note that Map 3.11-1 has been changed in the Final SEIS and displays the entire Bull Gulch RMA which includes the Bull Gulch SRMA and the Bull Gulch WSA.

RC8 *The Colorado BLM State Director's policy is insufficient protection for the wilderness attributes of the Eagle Ranch area. Only a No Leasing designation will sufficiently protect this area.*

Response: The reviewer refers to Colorado BLM Policy (IM CO-97-044) which refers to lands included in the Conservationists' Wilderness Proposal for BLM lands, dated January 1, 1994. That policy was later updated by IM CO-98-017. In the Eagle Ranch area, the Conservationists's Proposal recommends wilderness designation for the entire Castle Peak and Bull Gulch WSAs and one area of approximately 3,700 acres adjacent to the Castle Peak WSA. The existing WSAs are unavailable for leasing at this time and are not affected by IM CO-97-044 nor the SEIS.

Any management actions, including oil and gas leasing and development, within the 3,700 acres adjacent to the Castle Peak WSA must be conducted consistent with guidance contained in IM CO-97-044 and IM CO-98-017. BLM has determined that the 3,700 acres adjacent to the Castle Peak WSA meet certain roadless criteria but has not re-examined the wilderness values of the area. It should be noted that BLM did review this area in the early 1980s and determined at that time the area did not contain sufficient wilderness values to warrant its inclusion in the WSA.

The reviewer provides no information as to why the guidance of BLM policy in this regard is insufficient. BLM has concluded that the policy provides a reasonable process to evaluate the roadless and wilderness values identified in the Conservationist's Wilderness Proposal.

It should be noted that the Preferred Alternative includes a NSO, with few exceptions for all the Recreation Management Areas. Thus, independent of the wilderness attributes mentioned by the reviewer, these areas have been identified by BLM as providing important non-motorized recreation values. Refer to Chapter 2, Section 2.6, for a discussion of the rationale for the NSOs proposed in the Preferred Alternative for the Recreation Management Areas.

RC9 ***If the Castle Peak, King Mountain, Pisgah Mountain and other areas in Eagle County were set aside for recreational opportunities, why is BLM recommending revision of the land use plan that will allow oil and gas leasing and development?***

Response: The Castle Peak, King Mountain, Pisgah Mountain and other Recreation Management Areas proposed for NSO protection in the Preferred Alternative have not been "set aside" for recreational opportunities. Rather, previous land use planning decisions have acknowledged the non-motorized recreation opportunities, and other values, these areas provide. Travel management designations were enacted for these areas to facilitate maintenance of such values. However, travel management designations do not preclude other multiple uses. In fact, most travel orders specifically provide for a variety of exceptions to the travel rules.

When contemplating land use proposals in areas affected by travel management restrictions, the impact of the proposed land use on the values for which the travel restrictions were enacted, would be evaluated by BLM. Multiple uses consistent with the GSRA RMP would be accommodated, to the extent that such uses have minimal impacts to the values protected with the travel management designations. Refer to Chapter 2, Section 2.4, for more information concerning multiple use implications of the Recreation Management Areas NSO.

The Recreation Management Areas mentioned by the reviewer have been available for oil and gas leasing for many years. Thus, the SEIS does not propose a new leasing program, but considers modifications to the protective measures to be attached to a lease in the event the Recreation Management Areas are leased. It should be noted that the Preferred Alternative includes a NSO, with no exceptions, for most of the Recreation Management Areas. These areas have been identified by BLM as providing important non-motorized recreation values. Refer to Chapter 2, Section 2.6 for information concerning the rationale for the NSOs proposed for the Recreation Management Areas.

RC10 ***Recreationists have no exclusive rights and the proposed NSOs on RMAs are an excessive constraint on mineral resources.***

Response: Multiple use, including recreation, continues to be a mission of the BLM. As stated in Chapter 2, Section 2.5.2, two of the objectives of the Proposed Action are "to provide a reasonable balance between surface and subsurface resources" and "acknowledge BLM's multiple-use mandate." However, BLM acknowledges that finding the appropriate balance is very complex and many reviewers would offer varying perspectives on the reasonableness of the balance provided by the Preferred Alternative. Refer to Chapter 2, Section 2.6, for information concerning the rationale for the Preferred Alternative.

RC11 ***The SEIS states that there may be roadless areas in the NOSR (page 4-41). No irretrievable commitment of resources by leasing should be undertaken before a wilderness inventory is performed.***

Response: A supplemental wilderness inventory was completed by BLM for the NOSR Production Area in October, 1998. BLM concluded the area lacked wilderness characteristics. Refer to Chapter 4, Section 4.15 for more information on the supplemental wilderness inventory. As stated in Chapter 1, Section 1.3, no leasing decisions for the remainder of the NOSR are being considered at this time. Appropriate wilderness inventories would be completed prior to leasing those lands.

RC12 ***The GSRA should review all roadless and non-motorized areas to adequately assess the cumulative impacts prior to leasing.***

Response: Please refer to Response NP18. BLM conducted wilderness inventories for lands in the GSRA prior to 1984 and designated Wilderness Study Areas at that time. The wilderness inventories included an evaluation of all roadless areas. Additional inventories were completed on the NOSR Production Area and on an area of approximately 3,700 acres adjacent to the Castle Peak WSA Refer to RC8 and Chapter 4, Section 4.15, for more information on the inventory conducted on the NOSR Production Area and the roadless review conducted for lands adjacent to the Castle Peak WSA.

All lands within the GSRA with travel management designations in place that essentially provide non-motorized recreation opportunities have been included in the SEIS as Recreation Management Areas. The inclusion of such areas is not a requirement of BLM policy. Rather, BLM has recognized these areas provide important non-motorized recreation values. Refer to Chapter 2, Section 2.6, for information concerning the rationale for the NSOs for the Recreation Management Areas.

Riparian (RP)

RP1 *BLM should explain its rationale for allowing any further development in riparian zones, including a discussion comparing the Draft SEIS NSO exception criteria to the FEIS Proposed Action that excepted riparian locations only after detailed and strict analysis of the consequences accompanied by a plan of recovery and stringent construction requirements.*

Response: Refer to Chapter 2, Section 2.6, for a discussion of the rationale for the Riparian and Wetland Zones NSO and CSU. The basis for these two stipulations is BLM's position that, with proper planning, gas wellpads and roads can be designed to minimize impacts to riparian areas. The CSU provides ample authority and direction for BLM to require special design, construction and implementation measures. Contrary to the reviewers statements, the Riparian/Wetland CSU in the FEIS did not require a plan of recovery nor did it prescribe stringent construction requirements. In fact, the FEIS did not address measures for riparian and wetland areas outside the actual riparian vegetation zone.

The reviewer may have confused the Riparian/Wetland CSU in the FEIS with the Fragile Soil Areas CSU in the FEIS; the Fragile Soil Areas CSU did include requirements for a reclamation plan and established some performance standards. The Erosive Soils and Slopes Greater than 30 Percent CSU in the Preferred Alternative replaces the Fragile Soil Areas CSU of the FEIS and incorporates many of the principles of the Fragile Soil Areas CSU though the threshold slope of concern was reduced from 40 percent in the FEIS to 30 percent in the SEIS. Refer to Chapter 2, Sections 2.4 and 2.6 for more information concerning the Erosive Soils and Slopes Greater than 30 percent CSU.

RP2 *Requirements on new leases to avoid wetlands and highly erodible soil have been relaxed in the preferred alternative.*

Response: This is not a correct interpretation of the Proposed Action Alternative. Configurations of riparian, erosive soil and steep slope protections in both the Proposed Action and the Preferred Alternative are at least as restrictive as the current FEIS requirements. The Proposed Action and the Preferred Alternative change the protection of the riparian vegetation zone from a CSU to an NSO. The FEIS designated a CSU on riparian vegetation and did not provide any special protection beyond the actual edge of the riparian vegetation. Under a CSU stipulation, BLM is still required to provide a location for a road and wellpad on the lease. Under an NSO stipulation, BLM can deny a location if resource values cannot be adequately protected. Just as in the FEIS, exceptions to the riparian NSO stipulation may only be granted subject to a determination by the Authorized Officer. The BLM felt that the exception statement in the FEIS was too general to portray the full intent of the analysis and subsequent decision-making process. Hence, the SEIS outlines specific examples of exception criteria. The SEIS also takes into account the need for a "buffer" area around the riparian zone to protect the habitat values and to eliminate or minimize any effects due to erosion by establishing a CSU on lands within 500 feet of the riparian area in both the Proposed Action and the Preferred Alternative. Such protection was not included in the FEIS.

Both the Proposed Action and the Preferred Alternative call for the same CSU on highly erosive soils that is described in the FEIS. In addition, both alternatives provide protection to steep slopes, though such protection is "triggered" at lower slope levels in the SEIS than the FEIS. See the comparison of alternatives in Table 2.4-1 for more information.

RP3 *The SEIS contains no discussion of the direct impact caused by surface runoff from oil and gas operations.*

Response: The SEIS includes multiple references to the potential impacts of surface runoff from oil and gas operations. See Sections 4.3.1, 4.9.1, and 4.9.2. These sections describe the potential for runoff from sites developed for oil and gas drilling if improperly engineered and reclaimed. BLM's ongoing reclamation efforts and a number of stipulation measures in the Preferred Alternative are aimed at preventing or minimizing such impacts.

RP4 *Future oil and gas development would impact only a small amount of riparian acreage. This would seem to argue for a Continuation of Current Management.*

Response: BLM is required to consider the cumulative impacts of all actions on the resource being analyzed. In other words, BLM must analyze the impacts of all activities on the riparian resource, not just activities permitted by BLM. Riparian areas are quite limited in Region 4 and provide very important habitat for most wildlife species. As stated in the Draft SEIS, a total of 54.5 percent of riparian areas in Region 4 have already been impacted by human development. This is a substantial impact and in order to protect the remaining riparian resource, BLM must ensure that any future adverse impacts authorized by BLM are kept to the absolute minimum.

RP5 ***Since no estimates of impact under the Proposed Action are presented, it is impossible to compare it with other alternatives.***

Response: The assessment of future impacts under the continuation of Current Management Alternative, Chapter 4, Section 4.3.2.1, indicates that, if past impacts are a guide, future drilling activity would affect an additional 189 acres of riparian habitat, an additional five percent. This amount of impact is not acceptable given the amount of impact that ha already occurred. Without a more precise estimate of actual future locations, however estimating the acres affected is highly speculative. The Maximum Protection, Proposed Action and Preferred Alternatives were all constructed, however, so that riparian impacts would be less than those under the CCM. That is to say, if actual future locations were to generate 189 acres of impact under the CCM, then less than 189 acres could be generated under the other alternatives.

RP6 ***If the Maximum Protection Alternative would have "limited impact on overall oil and gas development" (p. -7), then why not adopt the more ecologically sound alternative for the protection of the riparian resource?***

Response: The merits of individual mitigation measures proposed in any alternative were evaluated within the context of the information provided in the Draft SEIS and comments received during the public review period, as to their necessity, reasonableness and effectiveness. BLM has determined that the Preferred Alternative includes reasonable measures to protect riparian and wetlands areas. Refer to Chapter 2, Section 2.6 for information on the rationale for the specific measures designed to protect riparian areas. Essentially, BLM believes that prohibiting all oil and gas activities within 500 feet of riparian areas as proposed in the Maximum Protection Alternative would be overly restrictive and, in many cases, unnecessary.

Socioeconomic (SE)

SE1 ***There are no estimates of the royalties that will accrue to the federal government as a result of the new wells to be drilled in the BLM managed NOSR area.***

Response: Page 4-46 includes an estimate of federal royalties that would be generated by 300 new wells on federal mineral estate. Seventy of the 300 wells are assumed to be in the NOSR Production Area, with a proportional share of the production and the royalties generated.

SE2 ***Further analysis should be included in the SEIS regarding the impact on private property values as the result of oil and gas development.***

Response: BLM is unable to make any direct correlation between oil and gas development and negative impacts to property values. Refer to new information about "quality of life" added to the Final SEIS, Chapter 3, Section 3.18 and Chapter 4, Section 4.18.

SE3 ***Our area has relied on tourism and hunting for many years. If gas development destroys these things, our means of support will be gone.***

Response: BLM is unable to make any direct correlation between oil and gas development and negative impacts to tourism and hunting. Refer to new information about hunting and fishing revenues added to the Final SEIS, Chapter 3, Section 3.18 and Chapter 4, Section 4.18. Also, refer to Chapter 4, Section 4.11, for information on the impacts of oil and gas development on recreation, including big game hunting. Finally, BLM recognizes that sight-seeing and pleasure driving are an important element of tourism. The Preferred Alternative includes several measures to minimize the impacts of oil and gas development on important scenic values. Refer to Chapter 2, Section 2.4, for more information on the Preferred Alternative.

SE4 ***The restrictions to mitigate impacts on the NOSR will create unnecessary expense and ultimately limit oil and gas development. Natural gas that could be recovered will remain forever in the ground.***

Response: BLM understands that the mitigation measures to be implemented in the NOSR Production Area may well increase the cost of oil and gas drilling. The cost of drilling is one of the important elements considered by BLM when evaluating the tradeoffs between development of public land mineral reserves and protection of surface rights and resources. The Preferred Alternative is less restrictive than the Maximum Protection Alternative because BLM believes that these less restrictive measures will provide much the same resource protection while allowing a higher level of gas production. The increased cost that operators do incur are considered by BLM to be necessary expenses associated with the protection of natural resource values. Natural gas reserves that might be considered uneconomic at today's prices could, in fact, become economic in the future as prices and technology change.

SE5 *The socioeconomic analysis in the SEIS was inadequate because 1) the employment numbers are too low, 2) the document implies that the market for natural gas will decline over time, and 3) BLM has not looked at the economic, social and environmental benefits of further oil and gas activity in the GSRA, including the contribution that royalties from the mineral estate may allow ranchers to maintain that activity and forestall further residential growth.*

Response: Discussion of the way in which the socioeconomic analysis was prepared may be warranted. Section 3.18 of the Draft SEIS cites a phone survey of . oil and gas operators which produced the employment numbers. In the spring of 1998, all the principal operators in Region 4 were queried as to the number of construction, production and overhead personnel located both in the area and outside the area. The total number of employees will vary over time with the level of activity and with changes in company practices on locating employees. However, BLM believes the employee numbers used in the SEIS are representative of current levels of activity.

The reviewer is unclear as to the location of information on declining market prices. Neither the socioeconomic analysis nor the RFD assumed a decline in natural gas prices over time. It was assumed, in fact, that gas prices would vary over time in a cyclic fashion.

Perhaps the analysis in Section 3.18 understated the benefits of oil and gas development activity. Section 3.18 outlines the employment and government revenues generated by oil and gas activity in Region 4. These impacts are almost universally understood to be beneficial, and BLM believes that they are. Note that Appendix F, Government Revenues, contains additional information about local government revenues created by oil and gas development.

SE6 *The discussion of royalty distribution in Section 3.18 should be clarified.*

Response: The discussion of the distribution of federal royalties from the production of oil and gas has been rewritten in Section 3.18 of the Final SEIS.

SE7 *The oil and gas industry in Garfield County recently became aware of severance tax distributions that are based on the number of personnel employed in the industry. It appears the employees of service companies have not been included in this count. A new census based on this clarification is being prepared. and the number cited on page 3-50, 21, can be expected to increase significantly.*

Response: The potential change in the number of employees that provide the basis of severance tax distributions is noted.

Soils (SL)

SL1 *Given the numerous activities during oil and gas exploration and development, the conclusion that soil and water impacts are insignificant because they are indistinguishable from natural variation is suspect at best.*

Response: The reference on page 4-26 of the Draft SEIS, makes the point that increases in soil erosion at the regional level would be indistinguishable from natural variation. At the local level, the Draft describes the potential for large amounts of erosion, and BLM's reclamation efforts are aimed at minimizing that erosion.

SL2 *The BLM Authorized Officer should have the discretion to grant exceptions to NSO restrictions in appropriate circumstances, for example, an exception for a section of an adequately designed and constructed access road across a steep slope.*

Response: BLM agrees and such exceptions are provided in the NSO for Slopes Greater than 50 Percent in the Preferred Alternative. (Section 2.4 of Chapter 2)

SL3 *Eagle County does not permit roads on slopes greater than ten percent. Thirty-five percent is too steep for roads.*

Response: BLM has long experience in the management of roads on steep slopes. Such roads require more thorough consideration of soils, location and construction techniques, but they can be constructed in such a way that environmental damage is held to a minimum. BLM recently evaluated its experience with a number of oil and gas sites on steep slopes in Region 4. That evaluation led to a No Surface Occupancy stipulation on slopes greater that fifty percent in the Preferred Alternative. While roads and sites can be developed on slopes over fifty percent, they present a severe engineering challenge. Slopes between thirty and fifty percent also require special management, and they are addressed in the Preferred Alternative with the less restrictive Controlled Surface Use stipulation. Slopes below 30 percent are managed with BLM's general oversight authority, unless they are on highly erosive soils, in which case the CSU applies.

SL4 *A CSU on steep slopes would be more than adequate to avoid impacts on site productivity.*

Response: BLM agrees that in many cases BLM's authority under a Controlled Surface Use stipulation is adequate to avoid impacts on site productivity, especially if that authority involves a potential relocation of the site beyond 200 meters. There may be instances, however, where BLM's assessment of the potential impacts of site development in an area is substantial enough that BLM would prefer to actually deny any locations in that area. In such instances No Surface Occupancy authority is required. Refer to Chapter 2, Section 2.6, for the rationale for the Steep Slopes NSO. The reviewer may be referring specifically to the CSU on steep slopes from the Continuation of Current Management Alternative. That stipulation addressed slopes over 40 percent. The Preferred Alternative reduced that threshold slope. Refer to Chapter 2, Section 2.6, for discussion of the rationale for that change.

SL5 *The description of soils in the Draft SEIS does not accurately convey the highly erosional nature of the area. In fact, much of the "soil" described in this document as erosive or highly erosive is exposed bedrock in badland topography. The dominant landforms are erosional, with numerous landslides. Lower topographic areas are mantled with recent debris flow and mudflow deposits. When flow does occur in many of the intermittent streams, it contains a high percentage of suspended solids, taking on the characteristics of thin mud rather than water. Road blockages from mudflows are a frequent occurrence. Where colluvial deposits are found overlying bedrock, they frequently lack development of significant "soil" qualities due to frequent reworking or overlay.*

Response: BLM agrees with the reviewer's assessment of the soils found in much of the GSRA. The description of soils in Chapter 3, Section 3.8 may have been too general to explicitly capture the highly erosional nature of many parts of the GSRA, including much of Region 4.

SL6 *The stipulations regarding the maximum slope on which a wellpad or road may be constructed are unwarranted. Many sites have already been built on slopes over 25 percent, are stable and meet the BLM's reclamation guidelines.*

Response: BLM agrees that successful sites can be built on slopes over 25 percent. There are a number of examples within Region 4 of sites constructed on federal mineral estate that are stable and that are making progress towards BLM's reclamation goals. However, any site on steep slopes is challenging and the risks of failure are increased. There are a few examples within Region 4 of sites that have failed or that have presented extreme difficulty and cost. The Steep Slope NSO and the Steep Slope CSU in the Preferred Alternative have been designed to minimize the risk of failure. Please see Chapter 2, Section 2.6, for a discussion of the rationale for the slopes included in these stipulations.

Special Status Species (SS)

SS1 *Abrams Creek contains one of only 20 populations of genetically pure Colorado Cutthroat trout. What is being done to protect it?*

Response: The Preferred Alternative includes a No Surface Occupancy stipulation on riparian vegetation and a Controlled Surface Use stipulation in a buffer area 500 feet on either side of the riparian vegetation. These stipulations apply throughout the GSRA, including riparian areas adjacent to Abrams Creek. Among other things, the intent of both stipulations is to protect the quantity and quality of the water in those riparian areas. Such protection, of course, benefits aquatic species.

SS2 *The impact of prairie dogs outside Region 4 should be explored, because of its role as a keystone species.*

Response: The comment suggests an inquiry that is more in the nature of a research project and would be beyond the scope of the SEIS. Little oil and gas activity outside of Region 4 is anticipated in the RFD, and so, any consideration of impacts on prairie dogs outside of Region 4 would be speculative. A more generalized treatment of the relationship between prairie dogs and other species would clearly be outside the scope of the SEIS.

SS3 *Section 4.6.2.3 indicates that the proposed action may not provide sufficient protection for BLM sensitive species. Who within BLM will determine which species are to be sacrificed?*

Response: This assessment in the Draft SEIS misstated the situation with regard to the potential impact to sensitive species. Section 4.6.2.3 has been rewritten in the Final SEIS to indicate that the stipulations in the Proposed Action and the Preferred Alternative may not provide sufficient protection to portions of the population of the sensitive species, usually plants. Protection of BLM sensitive species is not as restrictive as protections for threatened and endangered species and usually involves tradeoffs between preservation of the species habitat and the rights of the lessee. The authorized officer who approves the APD is the decision-maker responsible for the tradeoff.

SS4 *The SEIS fails to mention the Canada Lynx which has likely habitat within the GSRA.*

Response: The oversight has been corrected in the Final SEIS. Please refer to Section 3.6, Special Status Species, Table 3.6-1.

SS5 *BLM should consult with the U.S. Fish and Wildlife Service (USFWS) prior to leasing decisions. Waiting to evaluate impacts on proposed drill sites may be too late.*

Response: It is not necessary to consult with the USFWS prior to leasing because the Endangered Species Act provides protection for threatened and endangered species that overrides the rights granted by a lease for federal oil and gas reserves. If any listed, proposed, or candidate federal species, or its habitat, is potentially affected by a proposed action, then a conference or consultation with USFWS is required. Based on the determination of the USFWS, appropriate mitigation, which may involve complete avoidance of the area, is incorporated into the proposed action.

Additionally, consultation prior to leasing would encounter a logistical problem. When consulting with USFWS, the proposed action must be specific enough for evaluation of the likelihood and degree of impact. A Biological Assessment could not be done until actual locations of proposed well sites are known and this information is generally not available prior to leasing. This issue is complicated by the fact that, quite often, leases are not fully developed for years after the lease has been granted. During this time, there could be additions to or deletions from the list of threatened and endangered species or changes in our understanding of habitat requirements that would make the initial pre-lease consultation invalid and require the process to begin again.

SS6 *Standard Lease Terms and Conditions are sufficient to protect Special Status species. The Continuation of Current Management Alternative (CCM) for special status species should be adopted.*

Response: The standard lease terms are not the same as the special status plant species NSO I the CCM Alternative. Standard lease terms do not specifically mention any special status species, and therefore the level of protection is not specified. The CCM alternative provides NSO protection for federal listed, proposed, and candidate species. No special protection is afforded to state listed species or to BLM sensitive species. The Preferred Alternative of the SEIS includes NSO protection for state listed species and CSU protection for BLM sensitive species. These added protective measures were deemed necessary to protect those species not adequately covered by federal law or the Continuation of Current Management Alternative. The NSO and CSU stipulations are a reflection of BLM's policy not to contribute to the need to list any species.

Transportation (TN)

TN1 *The cumulative effects and long-term consequences of roads have not been adequately analyzed.*

Response: The SEIS includes extensive commentary on roads and their effect on natural resources. Section 4.3.1, Riparian and Wetlands, and Section 4.5, Wildlife, rely largely on an evaluation of the developed system of roads throughout Region 4 to gauge the direct and indirect impacts on riparian function and wildlife habitat. Section 4.17, Transportation, provides an assessment of all roads constructed for the purpose of oil and gas drilling and calculates the resultant increase in road densities in Region 4 by locale. The need to closely manage construction of and access to newly developed roads is noted frequently throughout the document.

TN2 *The SEIS should note that, in addition to voluntary road maintenance, the oil and gas* *industry pays royalties, property taxes and other fees from which maintenance and road repair could be financed.*

Response: Appendix F, *Government Revserves* makes note of the substantial federal, state and local revenues created by oil and gas development activities in Region 4. For example, 1996 property tax revenues from oil and gas for all jurisdictions in Garfield County totalled just over three million dollars (Stranger, 1999).

Visual Resource Management (VR)

VR1 *The evaluation of cumulative visual impacts appears to justify further visual impact on BLM lands because of the predominant influence of the development on private lands. This influence makes it all the more important for BLM to minimize impacts.*

Response: BLM is committed to protecting visual resources on public lands throughout the GSRA, depending on the area's scenic quality and visual sensitivity as prescribed in previous management plans and further demonstrated by the visual resource protection stipulations identified in the Preferred Alternative. The NSO on slopes over 30 percent in the I- 70 viewshed, and the CSU on VRM Class II areas, will provide management tools to prevent unacceptable visual impacts on landscape features with important visual resource values. These stipulations will effectively retain the character of the landscape especially in areas that have not yet been leased, like the NOSR Production Area.

However, the evaluation of cumulative visual impacts in Section 4.12.3 recognizes that the overall character of the landscape may be modified over time by development occurring on private lands, due to the predominance of private property in the I-70 viewshed. There may be instances where site specific impacts which exceed VRM Class II visual contrast objectives may be acceptable on public lands where the character of the immediate project area is already highly modified by prior development. This could occur, for example, on a public land tract surrounded by highly modified or developed private lands where new construction that modifies the existing natural on-site conditions would nevertheless not be noticeable or attract attention, nor have an adverse effect on the overall landscape. If such instances are encountered, measures would still be employed to minimize visual impacts.

VR2 *The SEIS fails to adequately describe the viewscape quality in the Rulison community as it is not one of the key viewing points.*

Response: The key viewing areas selected for the EIS were intended to characterize the visible landscape and its visual sensitivity in order to evaluate potential visual impacts and possible needed mitigation at a regional planning level. The landscape visible from the Rulison community is the same as seen from a stretch of I-70 and Holms Mesa, and although viewing distances and viewing angles differ, the landscape is adequately characterized by those viewsheds for the purposes of this plan amendment.

VR3 *Oil and gas development will degrade the visual character that is so important to the residents of the area.*

Response: BLM is concerned about the potentially degrading visual impacts of gas development and has applied a number of measures to mitigate visual impacts on public land. During the environmental assessment of each drilling proposal, visual impacts are routinely evaluated and appropriate mitigation devised. Mitigation often has involved one or more of the following: working cooperatively with the operator to locate new roads or wellpads to minimize visual impact, placing pipelines on the surface or in the roadbed to minimize disturbance, painting production equipment a color that blends in with the surrounding vegetation and terrain, reclamation that diminishes the visual contrast. These measures have been applied to meet VRM objectives as best as possible on existing developing leases. Under the Preferred Alternative, a NSO on lands over 30 percent within the I-70 viewshed will provide additional protection. Although only this NSO will only be applicable on newly leased lands, BLM will continue cooperatively working with lease operators to minimize visual impacts elsewhere.

VR4 *Garfield County recommends that visual impacts be further and more specifically addressed. The SEIS reports that the Visual Resource Management plans are only applied to BLM lands.*

Response: More detailed assessment of the impacts on visual quality can only be done on the basis of specific proposals for development of roads and wells. This normally occurs at the time an APD or other project proposal is received through the environmental assessment process. The comment notes correctly that

VRM constraints can only be applied by the BLM on public lands under its jurisdiction, which make up only 20 to 25 percent of the area experiencing gas development. Without similar consideration for visual resources on non-BLM land, a change in the overall existing character of the landscape is likely to occur in the affected areas even though the visual quality of the public lands is preserved.

VR5 *The description of the visual impacts of future development in Section 4.12 is vague; there appears to be no distinction between the alternatives.*

Response: The description of the visual impacts of future development is clarified in Chapter 4, Section 4.12, providing more detail on the effects of the visual mitigation measure of each alternative.

VR6 *The visual standard that is seemingly being applied is that natural gas wells sites are visually objectionable by definition.*

Response: The visual standards used by BLM are defined by the Visual Resource Management classification system, including the objectives described in Appendix H of the Draft SEIS. The VRM system is aimed at preserving the existing character of the landscape, with varying management concern based on an area's scenic quality, viewing volume and distance, and other visual sensitivity factors. The variable management concern is reflected in the VRM classes, which prescribe the acceptable visual impact levels. Under this VRM system, any activity that causes landscape modifications (i.e. earthwork, vegetation clearing, or new structures) may be objectionable depending on the visual contrast it creates and the management objective for the affected area. For example, VRM Class II areas are of high scenic quality, highly visible in the foreground or middle ground, and are highly sensitive to visual impacts. The BLM management goal for these areas is to retain that landscape character by taking measures so that landscape modifications are not readily noticeable or attract attention. These measures may include careful selection of project locations, and other design and reclamation techniques. There are instances where well sites have been developed without attracting attention by taking advantage of terrain and vegetation features for screening and to minimize their visual contrast.

VR7 *The effect of oil and gas development on the outstanding visual resources of the Eagle Ranch/Castle Peak viewshed were not analyzed. The viewshed deserves protection for its visual sensitivity.*

Response: Please see Response NP2. The outstanding visual resources of the Castle Peak area have long been recognized. The VRM Class I and Class II designations in the area (from the 1984 RMP), the WSA recommendations for parts of the area, and the determination of the Castle Peak Travel Management Plan to protect the semi-primitive values of the area are all testament to BLM's appreciation of the area's visual quality. The RFD for Region 4 indicates no measurable impacts from oil and gas development are likely. In any case, if such development were to occur, the protections included in the Preferred Alternative are sufficient.

VR8 *The wells drilled by the Department of Energy on the NOSR cliffs is an example of the disregard for the basic consideration of others, and gives credence to groups that oppose any drilling.*

Response: Many area residents have indicated to BLM, through scoping meetings, conversations and comments on the Draft SEIS, the very high value they place on the scenic quality of the roan Cliffs. It is BLM's intent to protect those visual qualities through the use of protective stipulations. The I-70 Viewshed NSO would prohibit development of the Road Cliffs themselves and calls for mitigation of proposals for surface disturbance on areas within the viewshed that have slopes over 30 percent (the most visually sensitive part of the viewshed). Elsewhere in the GSRA, the CSU on VRM Class II areas will mitigate much of the visual impact of development.

VR9 *I-70 is not a scenic by-way. It shouldn't be managed as one.*

Response: The additional protection in the Preferred Alternative for the I-70 Viewshed is recognition of the importance of the visual quality of lands in the I-70 corridor, both to Colorado visitors who are travelling on I-70 and to the many residents of the area who live near the Colorado River. While I-70 itself may not meet the stringent criteria of a Scenic Byway, its importance to area residents and visitors warrants protection.

Water (WT)

WT1 *The "well accident" ruined our softener system and reverse osmosis system. We can't sell our property because of damage to the water supply.*

Response: As described in Section 3.9.2 and 4.9.2, BLM and the COGCC have increased the measures aimed at protecting underground water resources, including the installation of surface casing setting depth to 1,100 feet, in what is referred to as the "overpressured" zone. BLM is committed to protecting the sources of domestic water. (more?????)

WT2 *The drillers waste water. BLM should insist that they recycle water.*

Response: It is in the oil and gas companies' interest to conserve water, since water used in drilling and completion activities must be purchased. In fact, whenever possible, water and drilling mud are recycled. However, given the geologic considerations in Region 4, it is unlikely that some of the most efficient water recycling systems would work here.

WT3 *The SEIS contains no discussion of the storm water permit requirements of the Clean Water Act.*

Response: No discussion of storm water permit requirements is required in the SEIS. The Federal Register, volume 55, number 222, dated November 16, 1990, details permit requirements by category. Section 7, on pages 48029-48030, discusses permit applicability and application for Oil and Gas and Mining operations. Two points are of particular interest. One, "... operators that use good management practices and make expenditures to prevent contamination must not be burdened with the requirement to obtain a permit. Hence, section 402(1)(2)creates a statutory exemption from storm water permitting requirements for uncontaminated runoff from these facilities." Two, "The proposed rule provided that the notification requirements for releases in excess of RQs established under the CWA and CERCLA would serve as a basis for triggering the submittal of permit applications for storm water discharges from oil and gas facilities."

We recognize that section 8, pages 48033 and beyond, deals with application requirements for construction activities. In short, construction impacts of greater than 5 acres could require a permit. If there is a situation where pad and road construction impact exceeds the 5 acre threshold a permit would probably be required. The operator, not the BLM (land owner) would file this permit, with the state. BLM does not enforce state requirements. The BLM does however include a reminder for the operator to secure all necessary permits.

Wildlife (WL)

WL1 *What effect will the proposed 300 gas wells have on the wildlife resource which will in turn affect our local economy?*

Response: The analysis in the Final SEIS indicates that many factors have affected big game habitat in Region 4 and that the role of oil and gas development in that respect has been limited. Additionally, BLM has seen no evidence that the hunting activity in Region 4 has decreased during the recent period of oil and gas development.

Chapter 4 provides abundant information on the impacts on wildlife in Region 4. Oil and gas development. The future impact of oil and gas development on wildlife is estimated in terms of habitat that would be removed from production and that would be indirectly influenced by oil and gas development activities. As discussed in the Final SEIS, Chapter 4, Part 4.18, the impacts of oil and gas development on the local economy resulting from potential loss of wildlife habitat and wildlife populations is unknown and was not predicted by the BLM due to the difficulty of preparing reliable estimates. Many factors, often interrelated, influence wildlife. As documented in Chapter 2, Section 2.2, it is he cumulative effect of a variety of human uses that ha resulted in substantial effects on the natural landscape in Region 4. In fact, in many instances, oil and gas development is not the major cause of such impacts. Nonetheless, in consideration of the cumulative effects, BLM agrees additional measures are needed to protect important wildlife habitats.

WL2 *Only three of the wildlife seclusion areas are areas that are not already leased.*

Response: The Wildlife Seclusion Areas NSO establishes BLM's intention to manage such areas to protect certain wildlife and wildlife habitat values. Even though many of the Wildlife Seclusion Areas are already leased, BLM will work with the operator to achieve the objectives of the NSO to the extent such actions would be consistent with lease rights. Also, in the event leases expire, BLM would attach the NSO to the new leases. Refer to Chapter 2, Section 2.6 for more information on the consistency of the NSO with existing leases.

WL3 *The Draft SEIS states that "there are no recorded caves in Region 4" (page 3-29). This statement is no longer valid. The existence of the caves should be taken into account in decisions regarding oil and gas* *leasing and development on the Naval Oil Shale Reserves and adjacent BLM lands.*

Response: The reviewer's comment brought the caves to BLM's attention. A subsequent correspondence from the reviewer clarified the extent of the caves and several trips to the site by BLM staff confirmed the values present. The Preferred Alternative contains an NSO that protects the caves themselves and the watersheds above them. See Chapter 2, Section 2.4, for a description of the Anvil Points Caves NSO.

WL4 *There are no COAs to provide the level of protection that the NSO on seclusion areas seeks to achieve. This is contrary to the affirmations of the 1991 FEIS and ROD.*

Response: There are currently no COAs to achieve the goals of the Widlife Seclusion Areas NSO because the goal to be achieved by this measure was not established through a land use planning process like this SEIS. After the Final SEIS, the ROD is issued and all components of the plan would be implemented as appropriate. COAs would be developed when APDs are submitted.

WL5 *Critical winter habitat for elk and other species in Eagle county warrants No Leasing protection.*

Response: See GN16 and all of the responses concerning Leasing Policy and Practice. In general, it is the policy of BLM to make lands available for mineral leasing unless there are surface values at stake which cannot be protected or mitigated. Timing limitations, such al those included in all of the alternatives in the SEIS, have proven to be effective at protecting the winter habitat of many species.

WL6 *Use the latest telemetry technology for tracking day to day oil and gas production activities in order to reduce the disturbance to wildlife.*

Response: This may well be an effective tool for diminishing impacts in some areas, especially the NSO wildlife seclusion areas. Many of the wells in Region 4 have already converted to this technology and more are being converted. Note the Wildlife and Wildlife Habitat Lease Notice, which includes the use of remote sensors as a possible method to reduce disturbance to wildlife.

WL7 *Mutual cooperation, rather than rigid No Surface Occupancy stipulations, go farthest in achieving the goals of all parties, as demonstrated by the habitat improvement project o the High Mesa outside the community of Battlement Mesa.*

Response: BLM agrees that mutual cooperation of all stakeholders in oil and gas development is essential to achieve the goals and objectives described in the SEIS. The recent cooperative project for habitat improvements on High Mesa is a good example of such cooperation. Partly in recognition of this cooperative spirit, many of the NSOs include exceptions, indicating BLM's willingness to work with the operator to achieve the goals intended by the stipulations. Nonetheless, it must be recognized that in some instances and for certain surface values, oil and gas development may cause a level of impact that cannot be mitigated and could therefore be considered inconsistent with such values. For example, BLM has determined that oil and gas activities within the Recreation Management Areas would likely be inconsistent with the non-motorized recreation values. Accordingly, these areas were stipulated with NSOs, with no exceptions.

WL8 *The cumulative impacts section seems to indicate that over 100 percent of elk winter range will eventually be affected. How is this possible?*

Response: The methodology used to estimate the impacts of future development on big game relies on evaluation of the intrusive quality of new roads constructed for that development. Not knowing the location or the length of future roads, the analysis assumes that future impacts per well would be the same as the impacts per well to date. This methodology tends to overestimate impacts since, increasingly, new roads will be in areas already affected by existing roads and will be shorter. In essence, some new impacts may end up being double counted. Adding this impact to an impact estimate for elk winter habitat that is already very high creates the illusion that more than 100 percent of the habitat is affected. The new roads in fact create a more dense road system that further diminishes an already affected winter habitat. This situation is discussed in Chapter 4, Section 4.5.5.

WL9 *Given the expected added impacts of the proposed development on deer and elk, why is the preferred alternative not the Maximum Protection?*

Response: In terms of the impacts on wildlife or the mitigation available, there is little difference between the Maximum Protection Alternative and the Proposed Action or the Preferred Alternative. They all share the same Timing Limitations and the same NSO stipulations. The differences, permitting exceptions in seclusion areas and the reliance on warranted site-specific mitigation described in the Wildlife Mitigation Lease Notice, were put into place because BLM determined that management of oil and gas development would be enhanced without adversely affecting wildlife. Refer to Chapter 2, Section 2.6 for information concerning the rationale for selection of the wildlife stipulation in the Preferred Alternative.

WL10 *We oppose Lease Notice 3 of the Proposed Action which would hold an APD hostage to a habitat protection plan designed by the CDOW.*

Response: The Wildlife and Wildlife Habitat Lease Notice was modified in the Preferred Alternative to require the operator to implement measures developed in concert with BLM to reduce impacts of oil and gas operations on wildlife and wildlife habitat. CDOW is an important partner with BLM and BLM will continue to seek CDOW's assistance in evaluating impacts to wildlife and developing measures to reduce such impacts. However, it was not BLM's intention to imply any delegation of BLM's authority on these matters to the CDOW.

WL11 *The SEIS contains no reference to the potential presence of the wolverine.*

Response: The oversight has been corrected in the Final SEIS. Please refer to Chapter 3, Section 3.6, Special Status Species, Table 3.6-1.

WL12 *NSO without exception in wildlife seclusion areas is excessive because seasonal restrictions should be sufficient and, in any case, deer and elk are known to habituate to human activity.*

Response: BLM agrees that the NSO for wildlife seclusion areas should allow for exceptions and has so modified the NSO in the Preferred Alternative, Chapter 2, Section 2.4.

WL13 *The statement that restoring productive wildlife habitat requires 20 years to accomplish is misleading. Establishing the same mix of native species to a maturity level that existed prior to development may require 20 years, but the productivity level for some species, including deer and elk, can be achieved in a few years. The issue is clarified in the Final SEIS.*

Response: BLM agrees that the statement is misleading in that it oversimplifies the situation. Some degree of productivity is returned very soon and the productivity and utility of the site improves gradually over time. However, a complete restoration of the type, size, density and quality of wildlife habitat originally found on the site may in fact take 20 years.

WL14 *The impact acreages in Table 4.5-1 disagree with those reported in the accompanying text.*

Response: Chapter 4, Section 4.5, Wildlife, has been modified in the Final SEIS. The discrepancy has been corrected.

WL15 *No comparison of the impacts of the different alternatives is made. As it is, the text seems to overstate the degree of impact that may occur.*

Response: Chapter 4, Section 4.5, Wildlife, has been modified in the Final SEIS. The comparison of the impacts of the alternatives should be clearer. The principle impacts on wildlife are cumulative and, to a great extent, have already occurred as a result of ongoing human activity in Region 4, from the earliest agricultural developments to the construction of Interstate 70.

Chapter Six

REFERENCES

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Chapter Seven

GLOSSARY

ACRONYMS

AACL	Acceptable Ambient Concentration Levels
ACEC	Area of Critical Environmental Concern
AIRFA	American Indian Religious Freedom Act
ANC	Acid Neutralizing Capacity
AO	Authorized Officer
APD	Application for Permit to Drill
AQRV	Air Quality Related Values
AUM	Animal Unit Month
BCF	Billion cubic feet
BEA	Bureau of Economic Analysis
BLM	Bureau of Land Management
BMSA	Battlement Mesa Service Association
BO	Barrels of Oil
CCM	Continuation of Current Management
CDOW	Colorado Division of Wildlife
CDPHE-APCD	Colorado Department of Public Health and Environment, Air Pollution Control Division
CFR	Code of Federal Regulations
CEQ	Council on Environmental Quality
CNAP	Colorado Natural Areas Program
CNHP	Colorado Natural Heritage Program
CO	Carbon monoxide
COA	Condition of Approval
COGCC	Colorado Oil and Gas Conservation Commission
COGEIS	Colorado Oil and Gas Environmental Impact Statement
CSIP	Colorado State Implementation Plan
CSU	Controlled Surface Use
DAU	Data Analysis Unit
DEIS	Draft Environmental Impact Statement
DOE	Department of Energy
DOI	Department of Interior
EA	Environmental Assessment
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FAR	Functioning At-Risk
FEIS	Final Environmental Impact Statement
FLPMA	Federal Land Policy and Management Act
FOOGLRA	Federal Onshore Oil and Gas Leasing Act of 1987
GIS	Geographic Information System
gm/hp-hr	Grams per horsepower-hour
GMU	Game Management Unit
GSRA	Glenwood Springs Resource Area
GVCA	Grand Valley Citizen Alliance
HAP	Hazardous air pollutants
hp	Horsepower
IHICS	Integrated Habitat Inventory and Classification System
IMPROVE	Interagency Monitoring of Protected Visual Environments
IWAQM	Interagency Workgroup on Air Quality Modeling
kg/ha-yr	Kilograms per hectare-year
MCF	1,000 cubic feet
MEI	Maximally exposed individual
MLA	Mineral Leasing Act of 1920
$\mu g/m^3$	Micrograms per cubic meter
MLE	Most likely exposure
MP	Maximum Protection
NEPA	National Environmental Policy Act
NOI	Notice of Intent
NOSR	Naval Oil Shale Reserves
NOT	Non-functional
NO_2	Nitrogen dioxide
NOx	Oxides of Nitrogen
NRCS	Natural Resource Conservation Service
NRHP	National Register of Historic Places
NSO	No Surface Occupancy
NTL	Notice to Lessees
NWCCOG	Northwest Colorado Council of Governments
NWPS	National Wilderness Preservation System
OHV	Off-Highway Vehicles
ONA	Outstanding Natural Area
O_3	Ozone
PA	Proposed Action
PAC	Primary Activity Center
PM_{10}	Particulate matter less than 10 microns in effective diameter

$PM_{2.5}$	Particulate matter less than 2.5 microns in effective diameter
POD	Plan of Development
PFC	Proper Functioning Condition
PSD	Prevention of Significant Deterioration
PV	Prospectively valuable
R&PP	Recreation and Public Purposes Act
RFD	Reasonably Foreseeable Development
RMP	Resource Management Plan
RNA	Research Natural Area
ROD	Record of Decision
ROW	Right-of-Way
SCS	Soil Conservation Service
SEIS	Supplemental Environmental Impact Statement
SNPC	Significant natural plant community
SO_2	Sulfur dioxide
SRMA	Special Recreation Management Area
SSF	Soil Surface Factor
T&E	Threatened and Endangered
TDS	Total Dissolved Soils
TL	Timing Limitation
TSP	Total Suspended Particulates
UMTRAP	Uranium Mill Tailings Remedial Action Project
USDA	United States Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USLE	Universal Soil Loss Equation
VOC	Volatile organic compounds
VRM	Visual Resource Management
WRIS	Wildlife Resource Information System
WRNF	White River National Forest
WSA	Wilderness Study Area

GLOSSARY

ABANDONMENT. Abandonment is plugging a well, removal of installations, and termination of operations for production from a well. Conclusively, abandoned unpatented oil placer mining claims are subject to conversion into a noncompetitive oil and gas lease pursuant to the Federal Oil and Gas Royalty Management Act of 1982 (30 U.S.C. 188(f)).

ACCIPITER. Any hawk of the genus Accipiter, of the family Accipitridae, that haw short, rounded wings and a long tail and that feeds chiefly on small mammals and birds.

ACTIVE NEST. A site where raptors nested or attempted to nest within the previous three years. For bald eagles, a site where a pair of bald eagles have at least attempted to nest within the last five years. Any nest location that can be directly tied to courtship, breeding, or brooding behavior is considered active. An inactive bald eagle nest is a once active nest in which neither courtship, breeding, or brooding activity has been observed at any time during the past five years.

AIR QUALITY CLASSES. Classifications established under the Prevention of Significant Deterioration portion of the Clean Air Act which limit the amount of additional air pollution above a legally defined baseline considered significant within an area. Class I applies to areas where almost any change in air quality would be significant; Class II applies to areas where the deterioration normally accompanying moderate well-controlled growth would be permitted; and Class III applies to areas where industrial deterioration would generally be allowed.

ALLUVIAL SOIL. A soil developing from recently deposited alluvium and exhibiting essentially no horizon development or modification of the recently deposited materials.

ALLUVIUM. Clay, silt, sand, gravel, or other rock materials transported by flowing water. Deposited in comparatively recent geologic time as sorted or semi-sorted sediment in riverbeds, estuaries, floodplains, lakes and shores, and in fans at the base of mountain slopes.

ANIMAL UNIT MONTH (AUM). The amount of forage necessary to sustain one cow and one calf or its equivalent for one month.

ANTICLINE. A fold, generally convex upward, whose core contains the stratigraphically older rocks.

APPLICATION. A written request, petition, or offer to lease lands for the purpose of oil and gas exploration and/or the right of extraction.

AQUATIC. Living or growing in or on the water.

AREA OF CRITICAL ENVIRONMENTAL CONCERN (ACEC). An area established through the planning process as provided in FLPMA where special management attention is required (when such areas are developed or used or where no development is required) to protect and prevent irreparable damage to important historic, cultural, or scenic values; or to fish and wildlife resources or other natural systems or processes; or to protect life and afford safety from natural hazards.

BASIN. (a) A depressed area with no surface outlet. (b) A low in the Earth's crust, of tectonic origin, in which the sediments have accumulated.

BIG GAME. Larger species of wildlife that are hunted, such as elk, deer, bighorn sheep, and pronghorn antelope.

CANDIDATE SPECIES. Any species not yet officially listed but which are undergoing a status review or are proposed for listing according to *Federal Register* notices published by the Secretary of the Interior or the Secretary of Commerce.

CONDITION OF APPROVAL (COA). Conditions or provisions (requirements) under which an Application for a Permit to Drill or a Sundry Notice is approved.

CONTROLLED SURFACE USE (CSU). Use and occupancy is allowed (unless restricted by another stipulation), but identified resource values require special operational constraints that may modify the lease rights. CSU is used for operating guidance, not as a substitute for the NSO or Timing stipulations.

CRUCIAL HABITAT. A USFWS term referring to a biological feature, that if lost, would adversely affect the species. Also used by CDOW to refer to a critical habitat, a designation which may be applied to any biological feature mapped for a species, thus indicating that within a given DAU, loss of that biological feature would adversely affect that species.

CULTURAL RESOURCES. Those fragile and non-renewable remains of human activity, occupation, or endeavor reflected in districts, sites, structures, buildings, objects, artifacts, ruins, works of art, architecture, and natural features that were of importance in human events.

CULTURAL RESOURCES INVENTORY CLASSES.

CLASS I. An existing data survey. This is an inventory of a study area to (1) provide a narrative overview of cultural resources by using existing information, and (2) compile existing cultural resources site record data on which to base the development of the BLM's site record system.

CLASS II. A sampling field inventory designed to locate, from surface and exposed profile indications, all cultural resource sites within a portion of an area so that an estimate can be made of the cultural resources for the entire area

CLASS III. An intensive field inventory designed to locate, from surface and exposed profile indications, all cultural resource sites in an area. Upon its completion, no further cultural resources inventory work is normally needed.

CUMULATIVE IMPACTS. The collective and aggregate impacts of all actions affecting a particular resource.

DATA ANALYSIS UNIT. A CDOW term for geographic areas thought to be used by one big game population. Comprised of one or more Game Management Units.

DIASTROPHISM. A general term for all movement of the crust produced by tectonic processes, including the formation of ocean basins, continents, plateaus, and mountain ranges.

DIRECTIONAL DRILLING. Drilling borehole wherein course of hole is planned before drilling. Such boles are usually drilled with rotary equipment at an angle to the vertical and are useful in avoiding obstacles or in reaching side areas or mineral estate beneath restricted surface.

DIVERSITY. The relative abundance of wildlife species, plant species, communities, habitats, or habitat features per unit of area.

EASEMENT. Right afforded a person or agency to make limited use of another's real property for access or other purposes.

ENDANGERED SPECIES. Any species which is in danger of extinction throughout all or a significant portion of its range.

ENVIRONMENTAL ASSESSMENT (EA). A concise public document prepared to provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact. It includes a brief discussion of the need for the proposal. alternatives considered, environmental impact of the proposed action and alternatives, and a list of agencies and individuals consulted.

ENVIRONMENTAL IMPACT STATEMENT (EIS). A formal public document prepared to analyze the impacts on the environment of a proposed project or action and released for comment and review. An EIS must meet the requirements of NEPA, CEQ guidelines, and directives of the agency responsible for the proposed project or action.

EXCEPTION. Case-by-case exemption from a lease stipulation. The stipulation continues to apply to all other sites within the leasehold to which the restrictive criteria applies.

FACIES. The aspect, appearance, and characteristics of a rock unit, usually reflecting the conditions of its origin; especially as differentiating the unit from adjacent or associated units,

FALL CONCENTRATION AREAS. That portion of black bear range occupied from 15 August to 30 September for the purpose of ingesting large quantities of mast and berries to establish fat reserves for the winter hibernation period.

FAULT. A fracture or zone of fractures along which there has been displacement of the sides relative to one another parallel to the fracture.

FEDERAL LAND POLICY AND MANAGEMENT ACT OF 1976 (FLPMA). Public Law 94-579 signed by the President on October 21, 1976. Establishes public land policy for management of lands administered by the Bureau of Land Management. FLPMA specifies several key directions for the Bureau, notably (1) management on the basis of multiple-use and sustained yield, (2) land use plans prepared to guide management actions, (3) public lands for the protection, development, and enhancement of resources, (4) public lands retained in federal ownership, and (5) public participation utilized in reaching management decisions.

FLUVIAL. Environment of deposition for sedimentary rocks which have been deposited by the action of steams and rivers.

FOLD. A curve or bend of a planar structure such as rock strata, bedding planes, foliation, or cleavage. A fold is usually a product of deformation, although its definition is descriptive and not of genetic and may include primary structures.

FORAGE. All browse and herbaceous foods that are available to grazing animals.

FORAGING TERRITORY (for nesting birds). An area around an active or inactive nest site in which it is expected that most hunting by the nesting birds would take place.

FOREST MANAGEMENT. The application of business methods and technical forestry principles to the operation of a forest property.

FORMATION. A body of rock identifies by lithic characteristics and stratigraphic position; it is prevailingly but not necessarily tabular, and is mappable at the Earth's surface or traceable in the subsurface (NACSN, 1983, Art. 24).

FOSSIL. The remains or traces of an organisms or assemblage of organisms which have been preserved by natural processes in the earths crust exclusive of organisms which have been buried since the beginning of historic time. Minerals, such a soil and gas, coal, oil shale, bitumen, lignite, asphaltum, and tar sands, phosphate, limestone, diatomaceous earth, uranium and vanadium, while they may be of biologic origin, are not here considered "fossils." Fossils of scientific value may occur within or in association with such materials.

FRAGILE SOIL. A soil that is especially vulnerable to erosion or deterioration due to its physical characteristics and/or location. Disturbance to the surface or the vegetative cover can initiate a rapid cycle of loss and destruction of the soil material, structure, and ability to sustain a biotic community.

GAME MANAGEMENT UNIT. A CDOW term for a geographic area equal to or smaller than a Data Analysis Unit that is used primarily to distribute numbers of hunters and harvest.

GEOPHYSICS. Study of the Earth by quantitative physical methods.

GRANITE WASH TRAP. Granite wash is a sandstone formed by weathered granite basement rock. Granite is composed of coarse, sand-size crystals that weather to from a sandstone covering the flanks of buried granite mountains and hills. Source rocks occur deeper, along the flanks.

GRAZING SYSTEM. Scheduled grazing use and non-use of an allotment to reach identified goals or objectives by improving the quality and quantity of vegetation.

GROUNDCOVER. The area of ground surface occupied by the stem(s) of a range plant, as contrasted with the full spread of its herbage or foliage, generally measured at one inch above soil level.

GROWING SEASON. Generally, the period of the year during which the temperature of vegetation remains sufficiently high to allow plant growth.

HABITAT. A specific set of physical conditions that surround a single species, a group of species, or a large community. In wildlife management. the major components of habitat are considered to be food, water, cover, and living space.

HIGH VALUE HABITAT/RED ZONES. Identified in GMU 32 analysis, these areas typically have a wide diversity of habitat types which include: sensitive habitats such as riparian or mesic areas, critical areas and ranges for big game and raptor nesting areas, providing food, cover and water. These zones have high biological values and are essential for maintaining healthy wildlife populations in this GMU.

HYDROCARBON. Any organic compound, gaseous, liquid, or solid, consisting solely of carbon and hydrogen.

IGNEOUS. Said of a rock or mineral that solidified from molten or partly molten material.

IMPACT. The effect, influence, alteration, or imprint caused by an action.

INTERMONTAINE. Situated between or surrounded by mountains, mountain ranges, or mountainous regions.

INVERTEBRATE. An animal lacking a backbone or spinal column.

KNOWN GEOLOGIC STRUCTURES (KGS). A trap in which an accumulation of oil and gas has been discovered by drilling and which is determined to be productive. Its limits include all acreage that is presumptively productive (43 CFR 3100.0.3(a)).

LAND TREATMENT. All methods of artificial range improvement and soil stabilization such as reseeding, brush control (chemical and mechanical), pitting, furrowing, water spreading, etc.

LATE SERAL. Advanced stage of ecological succession, stage which precedes climax condition.

LEASABLE MINERAL. Oil, gas, sodium, potassium, phosphate, coal, oil shale, tar sands, and asphaltic materials.

LEASE. A contract in legal form that provides for the right to develop and produce oil and gas resources for a specific period of time under certain agreed-upon terms and conditions.

LEASE NOTICE. Provides more detailed information concerning limitations that already exist in law, lease terms, regulations, or operational orders. A Lease Notice also addresses special items the lessee would consider when planning operations, but does not impose new or additional restrictions.

LEASE STIPULATIONS. Additional specific terms and conditions that change the manner in which operation may be conducted on a lease, or modify the lease rights granted.

LEASABLE MINERALS. Those minerals or materials designated as leasable under the Mineral Leasing Act of 1920. They include coal, phosphate, asphalt, sulphur, potassium and sodium minerals, and oil and gas. Geothermal resources are also leasable under the Geothermal Steam Act of 1970.

LEK. The mating site of some species of birds. In North America, males of certain grouse species gather at traditional (one used year after year) "leks" or "arenas" where they compete for mates by displaying. During their display, they call and inflate brightly colored air sacs on their necks, while repeatedly carrying out a ritualized dance.

LOCATABLE MINERALS. Minerals or materials subject to claim and development under the Mining Law of 1872, as amended. Generally includes metallic minerals such as gold and silver, and other materials not subject to lease or sale (some bentonites, limestone, talc, some zeolites. etc.).

LOCATION. Perfecting the right to a mining claim by discovery of a valuable mineral, monumenting the comers, completing discovery work, posting a notice of location, and recording the claim.

LONG-TERM. Long-term impacts would occur over a 20-year period.

LOW VALUE HABITAT/GREEN ZONES. Identified in GMU 32 analysis, these zones have low biological value. Typically, they have been heavily impacted in a negative manner which has significantly reduced overall wildlife habitat values.

MESIC. An environment having a moderate supply of moisture.

MIGRATION CORRIDORS. A specific mappable site through which large numbers of animals migrate and loss of which would change migration routes.

MINERAL ENTRY. Claiming public lands (administered by the BLM) under the Mining Law of 1872 for the purpose of exploiting minerals. May also refer to mineral exploration and development under the mineral leasing laws and the Material Sale Act of 1947.

MINERAL ESTATE (MINERAL RIGHTS). The ownership of minerals, including rights necessary for access, exploration, development, mining, ore dressing, and transportation operations.

MINERAL MATERIALS. Common varieties of sand, building stone, gravel, clay, moss rock, etc., obtainable under the Minerals Act of 1947, as amended.

MINING LAW OF 1812. Provides for claiming and gaining title to locatable minerals on public lands. Also referred to as the "General Mining Laws" or "Mining Laws."

MITIGATION. Alleviation or lessening of possible adverse effects on a resource by applying appropriate protective measures. Adverse effects can be rectified by either repairing, rehabilitating, or restoring affected environment and through compensation of the adverse effects by replacing or providing substitute resources or environments.

MODERATE VALUE HABITAT/BROWN ZONES. Identified in GMU 32 analysis, these areas have generally less wildlife diversity and/or abundance than adjacent high value areas. The areas are still important to wildlife however, natural circumstances or human actions have rendered these areas less desirable or essential to the maintenance of healthy wildlife populations.

MODIFICATION. Fundamental change to the provisions of a lease stipulation, either temporarily or for the term of the lease. A modification may. therefore, include an exemption from or alteration to a stipulated requirement. Depending on the specific modification, the stipulation may or may not apply to all other sites within the leasehold to which the restrictive criteria applied.

MONOCLINE. A geologic structure in which the strata are all inclined in the same direction at a uniform angle of dip.

MULTIPLE-USE. Management of the various surface and subsurface resources so that they are jointly utilized in the manner that will best meet the present and future needs of the public, without permanent impairment of the productivity of the land or the quality of the environment.

NATIONAL ENVIRONMENTAL POLICY ACT OF 1969 (NEPA). Public Law 91-190. Establishes environmental policy for the nation. Among other items, NEPA requires federal agencies to consider environmental values in decision-making processes.

NATIONAL REGISTER OF HISTORIC PLACES (NATIONAL REGISTER, NRHP). A listing of architectural, historical, archaeological, and cultural sites of local, state, or national significance, established by the Historic Preservation Act of 1966 and maintained by the National Park Service.

NESTING AREA. An area which includes good nesting sites and contains one or more active or inactive nest locations. Boundaries are drawn based on professional judgement to include most potential nesting habitat in the vicinity.

NO SURFACE DISTURBANCE. Defined on a case-by-case basis when the activity plan for an area is developed. In general, an activity would be allowed so long as it does not interfere with the management objectives of the area.

NO SURFACE OCCUPANCY (NSO). A fluid mineral leasing stipulation that prohibits occupancy or disturbance on all or part of the lease surface in order to protect special values or uses. Lessees may exploit the oil and gas or geothermal resources under leases restricted by this stipulation through use of directional drilling from sites outside the no surface occupancy area.

NOTICE TO LESSEES (NTL). A written notice issued by the Authorized Officer. These notices implement regulation and operating orders, and serve as instructions on specific item(s) of importance within a State, District, or Area.

OFF-HIGHWAY VEHICLE (OHV). Any motorized vehicle capable of or designed for travel on or immediately over land, water, or other natural terrain.

OFF-ROAD VEHICLE DESIGNATIONS.

Closed. Designated areas and trails where the use of off-road vehicles is permanently or temporarily prohibited. Emergency use of vehicles is allowed.

Limited. Designated areas and trails where the use of off-road vehicles is subject to restrictions such as limiting the number or types of vehicles allowed, dates and times of use (seasonal restrictions), limiting use to existing roads and trails, or limiting use to designated roads and trails. Under the designated roads and trails designation, use would be allowed only on roads and trails that are signed for use. Combinations of restrictions, such as limiting use to certain types of vehicles during certain times of the year, are possible.

Open. Designated areas and trails where off-road vehicles may be operated (subject to operating regulations and vehicle standards set forth in BLM Manuals 8341 and 8343).

ONLAP. An overlap characterized by the regular and progressive pinching out, toward the margins or shores of a depositional basin, of the sedimentary units within a conformable sequence of rocks, in which the boundary of each unit is transgressed by the next overlying unit and each unit in turn terminates farther from the point of reference.

ONLAP SANDS TRAP. Onlap sands are beach sands that were deposited on an unconformity surface as sea level rose. Numerous buttress sand can occur along a single unconformity and each can form a pool.

OVERSTORY. That portion of a plant community consisting of the taller plants on the site; the forest or woodland canopy.

PALEONTOLOGICAL RESOURCE. A site containing non-human life of past geological periods, usually in the form of fossil remains.

PATENT. A grant made to an individual or group conveying fee simple title to selected public lands.

PATENTED CLAIM. A claim on which title has passed from the federal government to the mining claimant under the Mining Law of 1872.

PIEDMONT. Lying or formed at the bsae of mountains.

PLANNING AREA. The geographical area for which land use and resource management plans are developed and maintained.

PRIMITIVE. Areas that are almost completely free of management controls lying more than three miles form the nearest point of motor vehicle access, unmodified landscapes and little evidence of other people.

PRODUCTION AREAS. That part of the home range of a species occupied by the females during a specific period of spring. This period is May 15 to June 15 for elk (only known areas are mapped and this does not include all production areas for the DAU).

PROPPANT. Sand or a sand-like material used to hold open the cracks made during hydraulic fracturing of a gas formation, allowing the gas to flow.

PUBLIC LAND. Any land and interest in land (outside of Alaska) owned by the United States and administered by the Secretary of the Interior through the Bureau of Land Management (BLM).

RAPTOR. Bird of prey with sharp talons and strongly curved beaks, e.g., hawks, owls, vultures, eagles.

RECLAMATION. Returning disturbed lands to a form and productivity that will be ecologically balanced and in conformity with a predetermined land management plan.

RECREATION AND PUBLIC PURPOSES ACT (R&PP). This Act authorizes the Secretary of the Interior to lease or convey public lands for recreational and public purposes under specified conditions to states or their political subdivisions. and to nonprofit corporations and associations.

RELICT. A plant species or community wich is a remnant from a former period when it was more widely distributed; a surviving trace or fragment..

RESOURCE AREA. A geographic portion of a BLM District that is the smallest administrative subdivision in the BLM.

RESOURCE MANAGEMENT PLAN (RMP). A land use plan that establishes land use allocations, multiple~use guidelines, and management objectives for a given planning area. The RMP planning system has been used by the BLM since about 1980.

RIPARIAN. Riparian areas are a form of wetland transition between permanently saturated wetlands and upland areas. These areas exhibit vegetation or physical characteristics reflective of permanent surface or subsurface water influence. Normally describes plants of all types that grow rooted in the water table or subirrigation zone of streams, ponds, and springs.

RIPARIAN/AQUATIC SYSTEM. Interacting system between aquatic and terrestrial situations. Identified by a stream channel and distinctive vegetation that requires or tolerates free or unbound water.

RIPARIAN ZONE. An area encompassing riparian and adjacent vegetation.

ROADLESS. Refers to the absence of roads that have been constructed and maintained by mechanical means to ensure regular and continuous use.

ROADS. Vehicle routes which have been improved and maintained by mechanical means to ensure relatively regular and continuous use. (A way maintained strictly by the passage of vehicles does not constitute a road.)

ROOST SITE. Groups of or individual trees that provide diurnal and/or nocturnal perches for one or more wintering bald eagles; includes a buffer zone extending 1/4 mile around these sites. A communal roost is a group of trees or an individual tree used by more than 15 eagles for diurnal and/or nocturnal perches.

SALINITY. Refers to the solids such as sodium chloride (table salt) and alkali metals that are dissolved in water. Often in non-saltwater areas, total dissolved solids is used as an equivalent.

SCOPING PROCESS. An early and open public participation process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action.

SECLUSION AREAS. Wildlife areas sheltered or screened from general human activity, providing solitude from intrusion, and a necessary refuge. These areas often serve as production areas or year- round habitat if the appropriate habitat components are available. Examples of use that may occur in these types of areas include raptor nesting, mountain lion and bear dens and big game production areas.

SEDIMENT YIELD. The amount of sediment produced in a watershed, expressed as tons, acre-feet, or cubic yards of sediment per unit of drainage area per year.

SEMIPRIMITIVE. Areas that have very few management controls lying between 1/2 mile and three miles from the nearest point of motor vehicle access, excepting four-wheel drive roads and trails, with mostly natural landscapes and some evidences of other people.

SERAL (see also LATE SERAL). Pertaining to the series of stages in ecological succession.

SEVERE WINTER RANGE. That part of the range of a species where 90 percent of the individuals are located when the annual snowpack is at its maximum in the two worst winters out of ten.

SHEET EROSION. The removal of a fairly uniform layer of soil from the land surface by runoff water.

SHORT-TIME. In this document. refers to the ten to twelve year life of the plan. Short-term impacts would occur within that time period.

SHUT-IN. An oil or gas well that is capable of production but is temporarily not producing.

SIGNIFICANT. An action that is analyzed in the context of the proposed action and the severity of the effects either beneficial or adverse. The degree of significant is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance exist which the effects on the quality of the human environment are likely to be highly controversial.

SIGNIFICANT NATURAL PLANT COMMUNITIES (SNPCs). Natural plant communities that are: 1) globally rare, 2) rare within the state, or 3) have not been substantially altered by human activity. The first two categories include vegetative communities in which the individual component species may not be rare but the unique combination of plant species is rare or uncommon. The third category of SNPCs involves plant community types which are significant not because of their rarity but because they represent relatively undisturbed natural communities with few nonnative species.

SPECIAL RECREATION MANAGEMENT AREA (SRMA). An area that possesses outstanding recreation resources or where recreation use causes significant user conflicts, visitor safety problems, or resource damage.

SPECIAL STATUS SPECIES. All species listed by the Federal or State government as endangered or threatened, including species that are proposed or candidate for such listing. This category also includes species listed by the Colorado BLM as sensitive.

SPLIT ESTATE. Lands where the owner of the mineral rights and the surface owner are not the same party in interest. The most common split estate is Federal ownership of mineral rights and other interest ownership of the surface. Where such a condition occurs, the Federal Government can lease the oil and gas rights without surface owner consent.

STIPULATION. A provision that modifies standard lease rights and is attached to and made a part of the lease.

STREAM BANK (and CHANNEL) EROSION. The removal, transport, deposition, recutting, and bed load movement of material in streams by concentrated water flows.

STUDY AREA. Refers to all the Resource Areas and Planning Areas covered in this EIS collectively.

SUITABILITY. As used in the Wilderness Act and in the Federal Land Policy and Management Act refers to a recommendation by the Secretary of the Interior or the Secretary of Agriculture that certain federal lands satisfy the definition of wilderness in the Wilderness Act and have been found appropriate for designation as wilderness on the basis of an analysis of the existing and potential uses of the land.

SUMMER RANGE. That part of the home range of a species that is not considered Winter Range, including what has traditionally been known as spring and fall transitional ranges.

SUNDRY NOTICE. Standard form to notify or approve well operations subsequent to Application for Permit to Drill, in accordance with BLM regulations.

SUPPLEMENTAL VALUES. Resources associated with wilderness which contribute to the quality of wilderness areas.

SURFACE MANAGEMENT AGENCY. Any agency outside of the Department of the Interior with jurisdiction over the surface overlying federally owned minerals.

SUSTAINED YIELD. The achievement and maintenance in perpetuity of a high-level annual or regular periodic output of the various renewable resources of the public lands consistent with multiple-use.

SYNCLINE. A fold, the core of which contains the stratigraphically younger rocks; it is generally concave upward.

TECTONICS. A branch of geology dealing with the broad architecture of the outer part of the Earth, that is the regional assembling of structural or deformational features, a study of their mutual relations, origin, and historical evolution.

TERRESTRIAL. Living or growing in or on the land.

THREATENED SPECIES. Any species or a significant population of that species likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

THRUST FAULT. A fault with a dip of 45 degrees or less over much of its extent, on which the hanging wall (overlying side) appears to have moved upward relative to the footwall (underlying side).

TIMBER. Standing trees, downed trees, or logs which are capable of being measured in board feet.

TIMING LIMITATION (SEASONAL RESTRICTION). Prohibits surface use during specified time periods to protect identified resource values. The stipulation does not apply to the operation and maintenance of production facilities unless the findings of analysis demonstrate the continued need for such mitigation and that less stringent, project-specific mitigation measures would be insufficient.

TOTAL DISSOLVED SOLIDS (TDS). Salt, or an aggregate of carbonates, bicarbonates, chlorides, sulfates, phosphates, and nitrates of calcium, magnesium, manganese, sodium, potassium, and other cations that form salts.

TRAP. Any barrier to the upward movement of oil or gas, allowing either or both to accumulate. A trap includes a reservoir rock and an overlying or updip impermeable roof rock; the contact between these is concave as viewed from below. See also: definitions of types of stratigraphic traps below.

TRESPASS. Any unauthorized use of public land.

UNCONFORMITY. A substantial break or gap in the geologic record where a rock unit is overlain by another that is not next in stratigraphic succession, such as an interruption in the Continuity of a depositional sequence of sedimentary rocks or a break between eroded igneous rocks and younger sedimentary strata.

UNDERSTORY. That portion of a plant community growing underneath the taller plants on the site.

UNIVERSAL SOIL LOSS EQUATION (USLE). A formula for predicting soil loss resulting from sheet and rill erosion caused by rainfall.

UPDIP PINCH OUT OF SANDSTONE TRAP. An updip pinch of wedge out of a sandstone in shale forms a trap. These are common in coastal plains where updip is landward. They tend to be small traps. If uplift caused dip, the trap type is combination.

UTILIZATION. The proportion of current year's forage production that was consumed or destroyed by grazing animals; usually expressed as a percentage.

VALID EXISTING RIGHTS. Legal interests that attach to a land or mineral estate that cannot be divested from the estate until that interest expires or is relinquished.

VANDALISM. Willful or malicious destruction or defacement of public property; e.g., cultural or paleontological resources.

VEGETATION MANIPULATION. Planned alteration of vegetation communities through use of prescribed fire, plowing, herbicide spraying, or other means to gain desired changes in forage availability, wildlife cover, etc.

VEGETATION TYPE. A plant community with immediately distinguishable characteristics based upon and named after the apparent dominant plant species.

VERTEBRATE. An animal having a backbone or spinal column.

VISUAL RESOURCES. The visible physical features on a landscape (topography, water, vegetation, animals, structures, and other features) that comprise the scenery of the area.

VISUAL RESOURCE MANAGEMENT (VRM). The inventory and planning actions taken to identify visual resource values and to establish objectives for managing those values, and the management actions taken to achieve the visual resource management objectives.

VISUAL RESOURCE MANAGEMENT CLASSES. VRM classes identify the degree of acceptable visual change within a particular landscape. A classification is assigned to public lands based on the guidelines established for scenic quality, visual sensitivity, and visibility.

VRM CLASS I. This classification preserves the existing characteristic landscape and allows for natural ecological changes only. Includes Congressionally authorized areas (wilderness) and areas approved through the RMP where landscape modification activities should be restricted.

VRM CLASS II. This classification retains the existing characteristic landscape. The level of change in any of the basic landscape elements due (form, line, color, texture) to management activities should be low and not evident.

VRM CLASS III. This classification partially retains the existing characteristic landscape. The level of change in any of the basic landscape elements due to management activities may be moderate and evident.

This classification provides for major modifications of the characteristic landscape. The level of change in the basic landscape elements due to management activities can be high. Such activities may dominate the landscape and be the major focus of viewer attention.

VRM CLASS V. This classification applies to areas where the characteristic landscape has been so disturbed that rehabilitation is needed. Generally considered an interim short-term classification until rehabilitation or enhancement is completed.

VISUAL SENSITIVITY. Visual sensitivity levels are a measure of public concern for scenic quality and existing or proposed visual change.

WAIVER. Permanent exemption from a lease stipulation. The stipulation no longer applies anywhere within the leasehold.

WILDERNESS. An area formally designated by Congress as a part of the National Wilderness Preservation System.

WILDERNESS CHARACTERISTICS. Identified by Congress in the Wilderness Act of 1964; namely, size, naturalness, outstanding opportunities for solitude or a primitive and unconfined type of recreation, and supplemental values such as geological, archaeological, historical, ecological, scenic, or other features.

WILDERNESS INVENTORY. An evaluation of the public land in the form of a written description and a map showing those lands that meet the wilderness criteria as established under Section 603(a) of FLPMA and Section 2(c) of the Wilderness Act. The lands meeting the criteria will be referred to as WSAs.

WILDERNESS MANAGEMENT POLICY. Policy document prescribing the general objectives, policies, and specific activity guidance applicable to all designated BLM wilderness areas. Specific management objectives, requirements, and decisions implementing administrative practices and visitor activities in individual wilderness areas are developed and described in the wilderness management plan for each unit.

WILDERNESS STUDY AREA (WSA). An area determined to have wilderness characteristics. Wilderness Study Areas will be subject to interdisciplinary analysis through BLM land use planning system and public comment to determine wilderness suitability. Suitable areas will be recommended to the President and Congress for designation as wilderness.

WILDLIFE MANAGEMENT SPECIES OF CONCERN. Those species that are economically important are considered sensitive, are protected by law or have high visibility.

WILDLIFE RESOURCE INFORMATION SYSTEM. A database available from the Colorado Division of Wildlife that stores habitat inventory information. It provides for storage, retrieval, display and analysis of computerized mpas information on wildlife distributions and habitats. Meta data accompanying this database provides a descriptive writeup of the respective Data Analysis Units for which habitat is mapped.

WINTER CONCENTRATION AREAS. That part of the winter range of a species where densities are x percent greater (defined for each DAU) than the surrounding winter range density during the same period used to define winter range in the average five winters out of ten.

WINTER RANGE. That part of the home range of species where 90percent of the individuals are located during a site-specific period of winter during the average five winters out of ten (this period is to be defined by CDOW personnel for each DAU).

WITHDRAWAL. An action which restricts the use of public land and segregates the land from the operation of some or all of the public land and mineral laws. Withdrawals are also used to transfer jurisdiction of management of public lands to other federal agencies.

Appendix A

CONTINUATION OF CURRENT MANAGEMENT ALTERNATIVE

I. Introduction

This Appendix describes the lease stipulations for the Continuation of Current Management Alternative. These are the stipulations contained in the November, 1991, Record of Decision to Glenwood Springs Resource Plan Amendment. These measures establish a set of management objectives, development constraints, or standard operating procedures chosen by BLM to manage oil and gas on public lands. Though a particular measure may be shown in this Appendix as a lease stipulation for a new lease, BLM could choose to use the same measure as a COA on an old lease provided the measure is consistent with lease rights.

II. Lease Stipulations

A. No Surface Occupancy Stipulations (NSO)

1. Within the area of an approved **surface coal mine**: Conservation of natural resources. This stipulation may be waived without a plan amendment if the lessee agrees that any well approved for drilling will be plugged below the coal when the crest of the highwall approaches within 500 feet of the well, and that the well will be re-entered or redrilled after completion of mining operations through the well location. A suspension of operations and production will be considered when the well is plugged and a new well is to be drilled after mining operations move through the location.

Note: This stipulation was not correctly stated in the Record of Decision. The above language is from the FEIS.

2. Grouse (includes sage grouse, mountain sharp-tailed, lesser and greater prairie chicken). NSO within one-quarter mile radius of a lek site (courtship area).

Exception for grouse leks. The NSO area may be altered depending upon the active status of the lek or the geographical relationship of topographical barriers and vegetation screening to the lek site.

3. Raptors (includes golden eagle and osprey; all accipiters; falcons, except kestrel; buteos; and owls). Raptors that are listed and protected by the Endangered Species Act are addressed separately. NSO within one-eighth mile radius of a nest site.

Exception for raptor nest site.: The NSO area may be altered depending on the active status of the nest site or the geographical relationship of topographic barriers and vegetation screening to the nest site.

4. Bald Eagle. NSO within one-quarter mile radius of the roost or nest site.

Exception for bald eagle roost site: The NSO applies to the essential features of the winter roost site complex. The NSO area may be altered, depending on the active status of the roost or the geographical relationship of topographic barriers and vegetation screening.

There are no exceptions identified for nest sites.

5. Peregrine Falcon. NSO within one-quarter mile radius of cliff nesting complex.

No exceptions identified.

6. Mexican Spotted Owl. NSO within one-quarter mile radius of the confirmed roost or nest site.

No exceptions identified.

7. Waterfowl and Shorebird. NSO on significant production areas (Major areas are Waterfowl Habitat Management Areas and rookeries.)

No exceptions identified.

8. NSO on habitat areas with **special status plant species** (Includes federally listed and proposed species for listing.)

Exception for special status plant species habitat.:The NSO may be altered after important factors are considered in a site-specific impact analysis such as the type and amount of disturbance, plant frequency and density, and the relocation of disturbances.

9. Major River Corridors. Protection of a) threatened and endangered and sensitive fish and wildlife species, b) riparian values, c) waterfowl production areas, d) the lower Colorado River ACEC. One-half mile buffereither side of the high water mark of the river.

No exceptions identified.

10. Rifle Falls and Glenwood Springs Fish Hatcheries. Protection of water quality and quantity supplying the Rifle Falls and Glenwood Springs Fish Hatcheries: Two-mile radius of the hatcheries.

Exception criteria include special mitigative measures developed in consultation with the Colorado Division of Wildlife.

11. Deep Creek ACEC/SRMA/VRM Class I/Cave Resource Area. Protection of recreational, visual and cave resource values. No Subsurface Occupancy. Drilling is prohibited through a zone beginning at the surface to an elevation of 5,600 feet above mean sea level.

No exceptions identified.

12. Bull Gulch ACEC/SRMA/VRM Class I. Protection of semi-primitive non-motorized recreational values and visual values.

No exceptions identified.

13. Thompson Creek ACEC/SRMA/VRM Class I. Protection of semi-primitive non-motorized recreational values and visual values.

No exceptions identified.

14. Hack Lake SMRA. Protection of semi-primitive non-motorized recreational and visual values.

Exception criteria include mitigative measures to screen operations from scenic viewsheds, reduce drill rig and other equipment noise to acceptable levels, and fence or otherwise protect recreating public from operations.

15. Rifle Mountain Park. Protection of recreational and visual values.

Exception criteria include mitigative measures to screen operations from scenic viewsheds, reduce drill rig and other equipment noise to acceptable levels, and fence or otherwise protect recreating public from operations. Exception mitigation will be developed in consultation with Park authorities.

16. Sunlight Peak Area. Protection of semi-primitive non-motorized recreational and visual values.

Exception criteria include mitigative measures to screen operations from scenic viewsheds, make drill rig and other equipment noise substantially unnoticeable at a distance, fence or make substantially unnoticeable at a distance, and/or otherwise protect recreating public from operations.

17. Garfield Creek, Basalt, and West Rifle Creek State Wildlife Areas. Protection of wildlife habitat values for which these areas were acquired: a) Crucial big game and upland game winter habitat and concentration areas, b) Riparian values.

Exception criteria include special mitigating measures approved by the Colorado Division of Wildlife.

18. Critical Watershed Areas. Protection of municipal watersheds providing domestic water for the communities of Rifle and New Castle and for the protection of the Glenwood Springs Debris Flow Zone.

No exceptions identified.

19. Colorado and Eagle Rivers SRMAs. Protect recreational and visual values.

Exception criteria include mitigative measures to screen operations from scenic views, reduce to acceptable level drill rig and other equipment noise, and fence or otherwise protect recreating public from operations.

B. Timing Limitation Stipulations (TL)

1. Big Game Species (includes mule deer, elk, pronghorn antelope and bighorn sheep). *Note:* Crucial winter habitat include severe big game winter range or other definable winter range as mapped by the Colorado Division of Wildlife.

- Big Game Crucial Winter Habitat - December 1 to April 30

Exception for big game crucial winter habitat: Under mild winter conditions, the last 60 days of the seasonal limitation period may be suspended. Severity of the winter will be determined on the basis of snow depth, snow crusting, daily mean temperatures, and whether animals were concentrated on the winter range during the winter months.

Exception for big game crucial winter habitat: This limitation may or may not apply to work requiring a Sundry Notice pending environmental analysis of any operational or production aspects.

2. Big Game Birthing Areas: (by species)

- Elk Calving -April 16 to June 30
- Pronghorn antelope fawning - May 1 to July 15
- Rocky Mountain Bighorn Sheep Lambing - May 1 to July 15
- Desert Bighorn Sheep Lambing - March 16 to May 30

Exception for Big Game Birthing Areas: When it is determined through a site-specific environmental analysis that specific actions would not interfere with critical habitat function or compromise animal condition within the project vicinity, the restriction may be altered or removed.

Note: This stipulation was modified slightly from the FEIS to remove pronghorn antelope and Desert Bighorn Sheep since these species are not present in GSRA.

3. Grouse (includes sage grouse, mountain sharp-tailed, and lesser and greater prairie chickens).

- Sage grouse crucial winter habitat - December 16 to March 15.

No exceptions identified.

4. Greater Sandhill Crane nesting and staging areas - March 1 to October 16.

No exceptions identified.

5. White Pelican nesting and feeding habitat areas - March 16 to September 30.

No exceptions identified.

6. Raptor nesting and fledgling habitat (includes the golden eagle and all accipiters, falcons, except the kestrels*; all buteos, and owls). Raptors that are listed and protected by the Endangered

Species Act are addressed separately. This seasonal limitation applies to a one-quarter mile buffer zone around the nest site.

*Kestrels are very adaptable to nest in a variety of habitats and their populations are stable and widespread.

7. **Ferruginous Hawk** nesting and fledgling habitat - February 1 to August 15. The sensitivity to human-associated disturbance activities requires a one-mile buffer zone to avoid nest abandonment.

8. **Osprey** nesting and fledgling habitat - April 1 to August 31. The sensitivity to human-associated disturbance activities requires a half-mile buffer zone to avoid nest abandonment.

Exception for raptors, ferruginous hawks and ospreys: (numbers 6, 7, and 8, above) nesting habitat. During years when a nest site is unoccupied or unoccupied by or after May 15, the seasonal limitation may be suspended. It may also be suspended once the young have fledged and dispersed from the nest.

9. **Mexican Spotted Owl** nesting and fledgling habitat - February 1 to July 31.

The Mexican spotted owl has been petitioned for listing as a threatened or endangered species to the U.S. Fish and Wildlife Service. Subject to the petition determination, the following habitat management guidelines and restrictions will be used to protect the Mexican spotted owl. These guidelines are adopted from the interim timber harvest management guidelines issued by the Forest Service, Southwest Region (*Federal Register*, Vol. 54, No. 124, June 29, 1989).

Mexican spotted owl habitat is restricted by use of a Timing Limitation applied to core areas within the owl habitat territory. The territories are by definition of two types: a) territory within which an owl(s) has been spotted, but no nests or roosts have been confirmed, and b) territory in which there is confirmed nesting, feeding, and roosting activity. The territory of a Mexican Spotted Owl is thought to be about 2,000 acres and does not overlap another individual's (or pair's) territory. Within the territory is a core area of 450 acres where there have been sightings only (a, above), or 1,480 acres where there are confirmed nests and/or roosts (b, above). The timing restriction from February 1 to July 31 is applied to the core areas (450 or 1,480 acres). A proposed oil and gas operation within the remainder of the territory (2,000 acres minus 450 or 1,480 acres) will be analyzed prior to permit approval and mitigated for compatibility with the owl habitat.

No specific exception criteria are currently identified.

10. **Bald Eagle Nesting Habitat** - December 15 to June 15

Restriction for bald eagle courtship behavior and nesting habitat: This time period is extremely sensitive to human-disturbance activities and may cause nest abandonment and desertion of long established territories. A one-half mile buffer zone around the nest site is required to prevent disruption of nesting.

Exception for bald eagle nesting habitat: During years when a nest site is unoccupied by or after May 15, the timing limitation may be suspended. It may also be suspended once the young have fledged and dispersed from the area.

11. **Bald Eagle Winter Roost Site** - November 16 to April 15. The sensitivity of bald eagles to human disturbance activities requires a one-half-mile buffer area around the roost site to avoid relocation to less suitable areas.

Exception for winter roost habitat: If there is partial or complete visual screening of the area of activity, the primary zone around the roost site may be reduced to one-quarter mile.

12. Peregrine Falcon Cliff Nesting Complex - March 16 to July 31

Restriction for peregrine falcon cliff nesting complex: The sensitivity of peregrine falcon to human-disturbance activities requires a half-mile buffer area around the nesting complex to prevent abandonment and desertion of established territories.

The following exception would apply only after Section 7 Consultation with the U.S. Fish and Wildlife Service was consummated.

Exception for nesting habitat: During years when a nest site is unoccupied by or after May 15, the seasonal limitation may be suspended. It may also be suspended once the young have fledged and dispersed from the nest.

C. Controlled Surface Use (CSU) Stipulation

1. Where oil and gas operations are proposed within the area of **federally leased coal** they will be relocated outside the area to be mined or to accommodate room and pillar mining operations. This stipulation may be waived without a Plan Amendment if the lessee agrees that the drilling of a well will be subject to the following conditions:

- Well must be plugged when the mine approaches within 500 feet of the well and re-entered or re-completed upon completion of the mining operation;
- Well must be plugged in accordance with Mine Safety and Health Administration (formerly Mine Enforcement and Safety Administration) Informational Report 1052; and
- Operator will provide accurate location of where the casing intercepts the coal by providing a directional and deviation survey of the well to the coal operator; *or*
- Relocate well into a permanent pillar or outside the area to be mined. A suspension of operations and production will be considered when the well is plugged and a new well is to be drilled after mining operations move through the location.

2. Fragile Soil Areas. Prior to surface disturbance of fragile soils, it must be demonstrated to the Authorized Officer through a plan of development that the following performance objectives will be met:

Performance Objectives:

- Maintain the soil productivity of the site.
- Protect off-site areas by preventing accelerated soil erosion (such as landsliding, gullying, rilling, piping, etc.) from occurring.
- Protect water quality and quantity of adjacent surface and groundwater sources.
- Select the best possible site for development in order to prevent impacts to the soil and water resources.

Fragile soil areas, in which the performance objectives will be enforced, are defined as follows:

- Areas rated as highly or severely erodible by wind or water, as described by the Soil Conservation Service in the Area Soil Survey Report or as described by on-site inspection.
- Areas with slopes greater than or equal to 35 percent, if they also have one of the following soil characteristics: (1) a surface texture that is sand, loamy sand, very fine sandy loam, fine sandy loam, silty clay or clay; (2) a depth to bedrock that is less than 20 inches; (3) an erosion condition that is rated as poor; or (4) a K factor of greater than 0.32.

Performance Standards:

- All sediments generated from the surface-disturbing activity will be retained on site.
- Vehicle use would be limited to existing roads and trails.
- All new permanent roads would be built to meet primary road standards (BLM standards) and their location approved by the Authorized

Officer. For oil and gas purposes, permanent roads are those used for production.

- All geophysical and geochemical exploration would be conducted by helicopter, horseback, on foot, or from existing roads.
- Any sediment control structures, reserve pits, or disposal pits would be designed to contain a 100-year, six-hour storm event. Storage volumes within these structures would have a design life of 25 years.
- Before reserve pits and production pits would be reclaimed, all residue would be removed and trucked off-site to an approved disposal site.
- Reclamation of disturbed surfaces would be initiated before November 1 each year.
- All reclamation plans would be approved by the AO in advance and might require an increase in the bond.

3. Prior to surface disturbing activities on **steep slopes** of, or greater than, 40 percent, an engineering/reclamation plan must be approved by the Authorized Officer. Such plans must demonstrate how the following will be accomplished:

- Site productivity will be restored.
- Surface runoff will be adequately controlled.
- Off-site areas will be protected from accelerated erosion such as drilling, gullying, piping, and mass wasting.
- Surface-disturbing activities will not be conducted during extended wet periods.
- Construction will not be allowed when soils are frozen.

No specific exception criteria are currently identified.

4. For the protection of perennial water impoundments and streams, and/or **riparian/wetland vegetation** zones, activities associated with oil and gas exploration and development including roads, transmission lines, storage facilities, are restricted to an area beyond the riparian vegetation zone.

Exceptions: This stipulation may be excepted subject to an on-site impact analysis with consideration given to degree of slope, soils, importance to the amount and type of wildlife and fish use, water quality, and other related resource values.

This stipulation will not be applied where the AO determines that relocation up to 200 meters can be applied to protect the riparian system during well siting.

5. Visual Resource Management Class II Areas: Relocation of operations more than 200 meters as required to protect visual values.

Exception criteria include mitigative measures to screen operations from scenic view sheds and restoration of disturbed areas to a condition substantially unnoticeable to casual observer.

D. Lease Notices

1. Surface disturbing activities in Class I and II **Paleontological Areas** will be inventoried by an accredited paleontologist approved by the AO.

2. In order to protect **nesting sage grouse**, surface disturbing activities proposed during the period between March 1 and June 30 will be relocated, consistent with lease rights and Section 6 of the standard lease terms, out of sage grouse nesting habitat. Sage grouse nesting habitat is described as sagebrush stands with sagebrush plants 30-100 centimeters in height and a mean canopy cover between 15 and 40 percent.

3. Sensitive Species Areas: In areas of known or suspected habitat of sensitive plant or animal species and high priority remnant vegetation associations, a biological and/or botanical inventory will be required prior to approval of operations. The inventory may be used to prepare mitigative measures (consistent with lease rights granted) to reduce the impacts of surface disturbance on the sensitive plant or animal species. These mitigating measures may include (but, are not limited to) relocation of roads, pads, pipelines, and other facilities, and fencing operations or habitat.

4. Blue Hill Archeological ACEC: This area contains a high density of prehistoric and cultural resources. Mitigation will be required at the operator's expense upon discovery of any resources at the time of development. Mitigation would require the services of an archaeologist (private contractor) approved by the Authorized Officer to conduct extensive field work, such as excavation and monitoring of construction activities.

Appendix B

THE MAXIMUM PROTECTION ALTERNATIVE

I. Introduction

This Appendix describes the lease stipulations for the Maximum Protection Alternative (MPA). These measures establish a set of management objectives, development constraints, or standard operating procedures chosen by BLM to manage oil and gas on public lands. Though a particular measure may be shown in this Appendix as a lease stipulation for a new lease, BLM could choose to use the same measure as a Condition Of Approval (COA) on an old lease provided the measure is consistent with lease rights. In addition, this Appendix describes some COAs unique to the MPA. This Alternative also includes one "No Lease" area in the vicinity of Project Rulison.

II. Lease Stipulations

A. No Surface Occupancy Stipulations (NSO)

1. Surface Coal Mines. NSO within the area of an approved surface coal mine for the conservation of natural resources. This stipulation may be waived without a plan amendment if the lessee agrees that any well approved for drilling will be plugged below the coal when the crest of the highwall approaches within 500 feet of the well, and that the well will be re-entered or redrilled after completion of mining operations through the well location. A suspension of operations and production will be considered when the well is plugged and a new well is to be drilled after mining operations move through the location.

2. Riparian and wetland zones. Activities associated with oil and gas exploration and development, including roads, transmission lines and storage facilities, are restricted to an area 500 feet beyond the outer edge of the riparian vegetation.

Exceptions: a) Within 500 feet of the riparian vegetation, exceptions may be granted if the Authorized Officer (AO) determines that the activity will have minimal impact on the habitat value of the riparian zone and its associated buffer, with consideration given to the size, type and importance of the riparian area; b) Within 100 feet of the riparian zone, an exception may be granted if the AO determines that the activity, in addition to satisfying exception criterion 1, will not contribute to increased sedimentation into the stream channel; c) Within the riparian vegetation, the only permitted exception is for stream crossings.

3. Major River Corridors. NSO within one-half mile of either side of the high water mark (bankfull stage) of the six major rivers: Colorado, Roaring Fork, Crystal, Frying Pan, Eagle and Piney. These riverine and adjacent habitats provide: a) special status fish and wildlife species habitat; b) important riparian values; c) water quality/ filtering values; d) waterfowl and shorebird production areas; e) valuable habitat for amphibians; f) high scenic and recreation values.

Exception: The NSO may be altered after the AO has considered the habitat values and the species present, the topographical and vegetative characteristics of the area and the type and amount of surface disturbance proposed.

Note: This stipulation is essentially the same as the Continuation of Current Management version, but was modified slightly to specifically identify the river corridors affected, to expand on the values provided by these river corridors, and to clarify the way in which exceptions would be evaluated.

4. Garfield Creek, Basalt, and West Rifle Creek State Wildlife Areas. Protection of wildlife habitat values for which these areas were acquired by the state, including crucial big game and upland game winter habitat and concentration areas and riparian values.

Exception criteria include special mitigative measures developed in consultation with the Colorado Division of Wildlife.

Note: This stipulation is essentially the same as the Continuation of Current Management version, but was modified slightly to clarify the operation of the exception.

5. Rifle Falls and Glenwood Springs Fish Hatcheries. Protection of the quality and quantity of surface water and underground aquifers supplying the Rifle Falls and Glenwood Springs Fish Hatcheries within a two-mile radius of the hatcheries.

Exception criteria include special mitigative measures developed in consultation with the Colorado Division of Wildlife.

Note: This stipulation is essentially the same as the Continuation of Current Management version, but was modified slightly to clarify the protection of underground aquifers as well as surface waters.

6. Grouse (includes sage grouse, Columbian sharptailed, lesser and greater prairie chicken). NSO within one-quarter mile radius of a lek site (courtship area).

Exception: The NSO area may be altered depending upon the active status of the lek or the geographical relationship to the lek site of topographical barriers and vegetation screening.

7. Raptors (includes golden eagle and osprey; all accipiters; falcons, except kestrel; buteos; and owls). Raptors that are listed and protected by the Endangered Species Act are addressed separately. NSO within one-eighth mile radius of a nest site. Exception: The NSO area may be altered depending on the active status of the nest site or the geographical relationship to the nest site of topographic barriers and vegetation screening.

8. Bald Eagle. NSO within one-quarter mile radius of the roost or nest site.

Exception: For roost sites, the NSO applies to the essential features of the winter roost site complex. After Section 7 consultation with the U.S. Fish and Wildlife Service, the NSO area may be altered, depending on the active status of the roost or the geographical relationship of topographic barriers and vegetation screening to the roost site.

Note: This stipulation is essentially the same as the Continuation of Current Management version but was modified slightly to indicate the need for Section 7 consultation.

9. Peregrine Falcon. NSO within one-quarter mile radius of cliff nesting complex.

Exception: After Section 7 consultation with the US Fish and Wildlife Service, exceptions may be permitted.

Note: This stipulation is essentially the same as the Continuation of Current Management version, but was modified slightly to indicate the need for Section 7 consultation.

10. Mexican Spotted Owl. NSO within one-quarter mile radius of a roost or nest site.

Exception: After Section 7 consultation with the US Fish and Wildlife Service, exceptions may be permitted.

Note: This stipulation is essentially the same as the Continuation of Current Management version, but was modified slightly to indicate the need for Section 7 consultation.

11. Wildlife Seclusion Areas. NSO within fourteen seclusion areas that provide high wildlife value. Eight are in GMU 32: Roan Cliffs, Cottonwood Gulch, and Webster Hill/Yellowslide Gulch (all in the NOSR Production Area); Hayes Gulch; Riley and Starkey Gulch; Riley Gulch;

Crawford Gulch; and Magpie Gulch. Six are in GMU 42: Paradise Creek, Coal Ridge, Lower Garfield, Jackson Gulch, Bald Mountain, and Battlement Mesa.

No exceptions are permitted.

12. King Mountain Waterfowl Area. NSO within one-quarter mile of the high water mark of Grimes-Brooks, Upper and Middle King Mountain and Noble reservoirs and wetland areas around and between these reservoirs.

No exceptions are identified.

13. Special Status Species. NSO on the habitat of those species listed as, or proposed, or candidates for listing as threatened or endangered by the federal or state government, or of species declared sensitive by the Colorado BLM. Habitat areas include occupied habitat and habitat necessary for the maintenance or recovery of the species.

Exception: Disturbance in the habitat area may be permitted after the Authorized Officer has considered the type and amount of disturbance, species population density, the relative abundance of the habitat, and other related factors. Section 7 consultation with the U.S. Fish and Wildlife Service would be required on threatened or endangered Species. Consultation with Colorado Division of Wildlife would be required for state listed species.

14. Domestic Watershed Areas. Protection of municipal watersheds providing domestic water for the communities of Rifle and New Castle.

Exception: Activity may be permitted if the AO determines, in consultation with the communities of Rifle and New Castle, that the applicant's proposal would produce only a negligible decrease in water quality.

Note: This stipulation is essentially the same as the Continuation of Current Management version, but was modified slightly to clarify the operation of the exception.

15. Debris Flow Hazard Zones. NSO for the protection of the Glenwood Springs debris flow zones.

Exception: Activity may be permitted by the AO in consultation with the City of Glenwood Springs and Garfield County, provided that the applicant's proposal will produce only a negligible increase in the risk of debris flow.

Note: This stipulation is essentially the same as the Continuation of Current Management version but was included with the Critical Watershed NSO. It was modified slightly to clarify the operation of the exception.

16. Highly Erosive Soils. NSO in identified areas of highly erosive soils, including areas identified in the RMP as Erosion Hazard Areas and Water Quality Management Areas, to minimize impacts on site productivity, adequately control surface runoff, reduce accelerated erosion and increase likelihood of successful reclamation.

Exception: The AO may permit exceptions for proposals at locations that will maintain the soil productivity of the site; protect off-site areas by preventing accelerated soil erosion (such as landsliding, gullying, rilling, piping, and mass wasting) from occurring; and protect water quality and quantity of adjacent surface.

17. Steep Slopes. NSO on slopes greater than 35 percent to minimize impacts on site productivity, adequately control surface runoff, reduce accelerated erosion and increase likelihood of successful reclamation.

No exceptions are permitted.

18. Site Disturbance Limit and Site Stability. On slopes greater than 25 percent, special design, construction and implementation measures, including relocation beyond 200 meters, may be required to minimize wellpad disturbance while maintaining a high probability of reclamation success. Typical wellpad size should be no more than 2.5 acres and cut and fill slopes should be on 2.5:1 slopes.

Exceptions: The AO may permit exceptions at locations where: a) the above performance objectives are met; b) it can be demonstrated that a larger disturbance is required, as for multiple well bores or deeper bores, and the GSRA reclamation objectives would be achieved; or c) it is determined that a cut slope greater than 2.5:1 would remain stable and safe (for both animals and humans) during the life of the well and additional bonding is provided to assure that the reclamation objectives will be met.

19. Semi-primitive Non-motorized Recreation Areas. For the protection of semi-primitive non-motorized and other recreational values, visual resources and cave resources, the following areas will be stipulated NSO.

- Deep Creek
- Bull Gulch
- Thompson Creek
- Hack Lake SRMA
- Rifle Mountain Park
- Sunlight Peak Area
- King Mountain
- Haff Ranch
- Siloam Springs
- Castle Peak
- Pisgah Mountain

No exceptions are permitted in any of these areas. *Note:* This stipulation combines NSO stipulations 11 (Deep Creek), 12 (Bull Gulch), 13 (Thompson Creek), 14 (Hack Lake), 15 (Rifle Mountain Park), and 16 (Sunlight Peak) from the Continuation of Current Management Alternative and adds recently acquired public land (Haff Ranch) and lands with revised travel management designations (Castle Peak, King Mountain, Siloam Springs and Pisgah Mountain).

20. Colorado and Eagle Rivers SRMAs. NSO required to protect recreational and visual values.

Exception criteria include mitigating measures to: screen operations from scenic viewsheds, make drill rig and other equipment noise unnoticeable at a distance, protect recreating public from operations, and restore disturbed areas to a condition substantially unnoticeable to the casual observer.

21. Sensitive Viewsheds. NSO on slopes over 25 percent with high visual sensitivity in the Battlement Mesa, Holmes Mesa, Interstate 70, Highway 13 and Rifle viewsheds.

Exceptions would be granted if proposed occupancy is effectively out of view, is of very low visual contrast, is not noticeable and does not attract attention.

22. Roan Cliffs Scenic Area. NSO to protect the scenic quality of the Roan Cliffs from Yellow Slide Gulch on the east of the NOSR Production Area to Hayes Gulch on the west.

Exceptions would be granted if proposed occupancy is effectively out of view, is of very low visual contrast, is not noticeable and does not attract attention.

23. Residential Areas. NSO within one-quarter mile of residences.

Exceptions: Should the occupants waive this stipulation, the AO may permit activity.

24. Sharrard Park Paleontological Area. NSO on the area of identified scientifically important paleontological resource.

Exception: The AO may permit activities that adequately mitigate impacts on the paleontological resource.

B. Timing Limitation Stipulations (TL)

1. **Big Game Winter Habitat** (includes mule deer, elk, pronghorn antelope and bighorn sheep). Protection of winter habitat which includes severe big game winter range and other high value winter habitat as mapped by the CDOW.

- Big Game Winter Habitat - December 1 to April 30.

Exception: Under mild winter conditions, the last 60 days of the seasonal limitation period may be suspended after consultation with the CDOW. Severity of the winter will be determined on the basis of snow depth, snow crusting, daily mean temperatures, and whether animals were concentrated on the winter range during the winter months. This limitation may apply to work requiring a Sundry Notice pending environmental analysis of any operational or production aspects.

2. **Big Game Birthing Areas.**

- Elk Calving -April 16 to June 30
- Pronghorn antelope fawning - May 1 to July 15
- Rocky Mountain Bighorn Sheep Lambing - May 1 to July 15
- Desert Bighorn Sheep Lambing - March 16 to May 30

Exception for Big Game Birthing Areas: When it is determined through a site-specific environmental analysis that actions would not interfere with critical habitat function nor compromise animal condition within the project vicinity, the restriction may be altered or removed.

3. **Grouse** crucial winter habitat and nesting habitat (includes sage grouse, Columbian sharptailed, and lesser and greater prairie chickens). Sage grouse nesting habitat is described as sagebrush stands with sagebrush plants between 30 and 100 centimeters in height and a mean canopy cover between 15 and 40 percent within a two mile radius of an active lek.

- Sage grouse crucial winter habitat - December 16 to March 15.
- Sage grouse nesting habitat - March 1 to June 30.

No exceptions are permitted for winter habitat.

Exceptions for nesting habitat: During years when the lek is inactive and it is determined that there is no nesting activity occurring by May 15, the seasonal limitation may be suspended.

Note: This stipulation was modified by the addition of the provision for sage grouse nesting habitat, which is a lease notice in the Continuation of Current Management Alternative.

4. **Greater Sandhill Crane** nesting and staging areas - March 1 to October 16.

No exceptions identified.

5. **White Pelican** nesting and feeding habitat areas - March 16 to September 30.

No exceptions identified.

6. **Raptor** nesting and fledgling habitat (includes the golden eagle and all accipiters; falcons, except the kestrel; all buteos; and owls). Raptors that are listed and protected by the Endangered Species Act are addressed separately. A one-quarter mile buffer zone around the nest site from February 1 to August 15.

7. **Ferruginous Hawk** nesting and fledgling habitat. A one-mile buffer zone from February 1 to August 15 to avoid nest abandonment.

8. Osprey nesting and fledgling habitat. A one-half mile buffer zone from April 1 to August 31 to avoid nest abandonment.

Exception for raptor, ferruginous hawk and osprey (4,5 and 6 above) nesting and fledgling habitat: During years when a nest site is unoccupied or unoccupied by or after May 15, the seasonal limitation may be suspended. It may also be suspended once the young have fledged and dispersed from the nest.

9. Mexican Spotted Owl nesting and fledgling habitat - February 1 to July 31.

The average Mexican spotted owl territory is estimated to encompass approximately 2,000 acres. Within this area, Primary Activity Centers (PACs) are defined around nesting, feeding, and roosting areas within the territory. These PACs are mapped as a one-half mile radius (600 acre) area around nests, roosts and the center of feeding areas and are not considered to be overlapping. With multiple sightings of the Mexican spotted owl but with no confirmed nest or roost sites, a PAC is defined as the area where habitat is used the most.

Exceptions may be identified after formal Section 7 consultation with the U.S. Fish and Wildlife Service.

Note: This stipulation is essentially the same as the Continuation of Current Management version, but was modified slightly to indicate the need for Section 7 consultation and to update the habitat description.

10. Bald Eagle Nest Site. A one-half mile buffer zone around the nest site is required to prevent disruption of nesting from December 15 to June 15.

Exceptions may be identified after formal Section 7 consultation with the U.S. Fish and Wildlife Service. The limitation may be suspended in years when the nest site is unoccupied by May 15 or once the young have fledged and dispersed from the nest.

Note: This stipulation is essentially the same as the Continuation of Current Management version, but was modified slightly to indicate the need for Section 7 consultation and to update the habitat description.

11. Bald Eagle Winter Roost Site. A one-half mile buffer area around the roost site to avoid relocation to less suitable areas is required from November 16 to April 15.

Exceptions may be identified after formal Section 7 consultation with the U.S. Fish and Wildlife Service. If there is partial or complete visual screening of the area of activity, the roost site may be reduced to one-quarter mile.

Note: This stipulation is essentially the same as the Continuation of Current Management version, but was modified slightly to indicate the need for Section 7 consultation.

12. Peregrine Falcon. A one-half mile buffer area around the cliff nesting complex from March 16 to July 31 to prevent abandonment and desertion of established territories.

Exceptions may be identified after formal Section 7 consultation with the U.S. Fish and Wildlife Service. The limitation may be suspended in years when the nest site is unoccupied by May 15 or once the young have fledged and dispersed from the nest.

Note: This stipulation is essentially the same as the Continuation of Current Management version, but was modified slightly to indicate the need for Section 7 consultation.

13. Waterfowl and Shorebird Nesting Areas. This stipulation protects nesting ducks from April 15 to July 15 in a one-quarter mile buffer around the nesting and production areas of the following reservoirs: Fravert Watchable Wildlife Area, Consolidated Reservoir and the King Mountain Reservoirs - Grimes-Brooks, Nobel and Upper and Lower King Mountain.

No exceptions are permitted.

C. Controlled Surface Use (CSU) Stipulations

1. Underground Coal Mines. Within the area of federally leased coal lands, oil and gas operations will be relocated outside the area to be mined or to accommodate room and pillar mining operations. This stipulation may be waived without a plan amendment if the lessee agrees that the drilling of a well will be subject to the following conditions:

- Well must be plugged when the mine approaches within 500 feet of the well;
- Well must be plugged in accordance with Mine Safety and Health Administration (formerly Mine Enforcement and Safety Administration) Informational Report 1052; and
- Operator will provide accurate location of where the casing intercepts the coal by providing a directional and deviation survey of the well to the coal operator; *or*
- Relocate well into a permanent pillar or outside the area to be mined. A suspension of operations and production will be considered when the well is plugged and a new well is to be drilled after mining operations move through the location.

2. Perennial water impoundments and streams. Activities associated with oil and gas exploration and development including roads, transmission lines, and/or storage facilities, may be required to move to an area beyond 200 meters of the water source to prevent disruption of use by livestock and wildlife in areas having very limited water sources.

3. Visual Resource Management (VRM) Class II and III Areas. Relocation of operations more than 200 meters as required to protect visual values.

No exceptions are permitted.

4. Water Quality Management Areas. CSU for areas identified as Water Quality Management Areas. To reduce erosion and sedimentation potential in watersheds identified in the GSRA RMP with water quality management concerns.

5. Sensitive Viewsheds. Relocation of operations more than 200 meters as required on slopes under 25 percent with high visual sensitivity in the Interstate 70 viewshed to meet Class II VRM objectives, effectively screen disturbed areas from view, and maintain low visual contrast levels.

D. Lease Notices

1. Class I and II Paleontological Areas. An inventory shall be conducted by an accredited paleontologist approved by the AO prior to surface-disturbing activities in these areas.

2. Special Status Species Areas. In areas of known or suspected habitat of special status plant or animal species, a biological inventory will be required prior to approval of operations. The inventory would be used to prepare mitigative measures to reduce the impacts of surface disturbance on the special status species. These mitigating measures may include, but are not limited to, relocation of roads, wellpads, pipelines, and other facilities, and fencing operations or habitat.

Given the high potential for special status species to occur in the NOSR Production Area, it is likely that a biological inventory will be required for most of that area prior to development activities.

Note: This lease notice is essentially the same as the Continuation of Current Management version, but was modified slightly to change the descriptor from "sensitive" to "special status" species.

3. Annual Reports of Reclamation Progress. All lessees in the GSRA are required to report to the AO annually on the ongoing progress of reclamation at locations developed on the lease. (See Appendix I of the draft SEIS.)

4. Air and Water Quality Monitoring. The operator may be required to participate in water and/or air quality monitoring to establish current water and/or air quality conditions as an environmental baseline and/or monitor changes in the baseline over time. The purpose of this monitoring is to establish the contribution of oil and gas development activities to reductions, if any, in either air or water quality in the affected area.

5. Emergency Communications Plan. The operator is required to prepare and maintain a current emergency communications plan. The plan shall be provided to the BLM, Colorado State Patrol, Garfield County and affected communities. The plan shall be made available to the general public upon request. The plan shall contain: information sufficient to describe the potential for emergency incidents related to oil and gas development which pose an immediate danger to human health and safety and would normally require immediate actions by the operator to remove the threat, such as for hazardous materials spills; actions to be taken by the operator in the event of such an incident; and a communications plan to inform appropriate authorities and potentially affected citizens.

6. Anvil Points Landfill. Any operations within the Anvil Points landfill area owned by Garfield County shall be consistent with the terms and conditions established in EA-CO-078-5-31.

III. Conditions of Approval

Wildlife

All crews should be discouraged from carrying dogs (except guard or seeing-eye dogs) and firearms while traveling to and from and while at the construction site, staging area or other facilities associated with any exploration or development operation. If dogs are present, they should be under the direct control of the employee at all times, and not allowed to run free.

Any game and/or fish violations, including harassment of wildlife, occurring on or near the lease/operation site should result in suspension or dismissal of any employee or subcontractor found in violation.

Containers used for food items should be bear proof.

Once well spacing reaches 1:160 acres in any contiguous 640 acres within a high-value wildlife area, daily well monitoring for all areas in that zone will be accomplished via remote sensing. New wells will be hooked up once the system goes on-line. For pre-existing wells, a one-year grace period would be allowed to purchase, install, and test the monitoring system in areas where well spacing is already at or above this threshold spacing.

In big game winter range classified as high value or crucial, all motorized vehicle activity associated with normal daily well activities, such as monitoring and routine maintenance, will be restricted to the period between 10:00 a.m. and 3:00 p.m. from December 1 through April 30.
If a well or compressor station is located within one-quarter mile of riparian zones or seclusion areas, appropriate noise mitigation (hospital muffler, vegetation screening, electric motors, etc.) will be employed to ensure that federal, state, and local noise standards are adhered to during the operation of the well.

Operators shall mitigate impacts on big game winter range when total cumulative surface disturbance reaches ten acres or more in size, as determined by the AO. Cumulative surface disturbance shall include actual impact from the proposal and surface disturbance from previous development occurring on winter range in the respective Game Management Unit. Mitigation shall include three acres of enhanced habitat for every acre of surface-disturbed habitat. Project design for enhancement work will be developed by the AO in coordination with the operator and the CDOW.

Project Rulison Monitoring. All wells located within three miles of Project Rulison shall be subject to oversight measures adopted by the Colorado Oil and Gas Conservation Commission (COGCC). Generally, APDs for such wells will be reviewed by the Department of Energy (DOE) for consideration if such wells should be incorporated into DOE's regular monitoring program.

Groundwater Risk Assessment. Inside the high-pressure zone (see Chapter 3), the operator shall provide a written assessment of the groundwater geology, which will include a description of the location of domestic wells within 1,320 feet of the proposed location, and a description of the actions to be taken to prevent contamination of domestic groundwater.

IV. No Lease Areas

Project Rulison. No leasing within three miles of the Project Rulison test site.

Appendix C

THE PROPOSED ACTION

I. Introduction

This Appendix describes the lease stipulations for the Proposed Action Alternative. These measures establish a set of management objectives, development constraints, or standard operating procedures chosen by BLM to manage oil and gas on public lands. Though a particular measure may be shown in this Appendix as a lease stipulation for a new lease, BLM could choose to use the same measure as a COA on an old lease provided the measure is consistent with lease rights.

II. Lease Stipulations

A. No Surface Occupancy Stipulations (NSO)

1. Surface Coal Mines. NSO within the area of an approved surface coal mine for the conservation of natural resources. This stipulation may be waived without a plan amendment if the lessee agrees that any well approved for drilling will be plugged below the coal when the crest of the highwall approaches within 500 feet of the well, and that the well will be re-entered or redrilled after completion of mining operations through the well location. A suspension of operations and production will be considered when the well is plugged and a new well is to be drilled after mining operations move through the location.

2. Riparian and wetland zones. To maintain the proper function of riparian zones, activities associated with oil and gas exploration and development, including roads, trnsmission lineds and storage facilities, are restricted to an area beyond the outer edge of the riparian vegetation.

Exceptions: a) An exception may be granted if the AO determines that the activity will cause no loss of riparian vegetation, or that the vegetation lost can be replaced within three to five years with vegetation of like species and age class; b) within the riparian vegetation, an exception is permitted for stream crossings, if an area analysis indicates that no suitable alternative is available.

3. Major River Corridors. NSO within one-half mile of either side of the high water mark (bankfull stage) of the six major rivers: Colorado, Roaring Fork, Crystal, Frying Pan, Eagle and Piney. These riverine and adjacent habitats provide: a) special status fish and wildlife species habitat; b) important riparian values; c) water quality/filtering values; d) waterfowl and shorebird production areas; e) valuable habitat for amphibians; f) high scenic and recreation values.

Exception: The NSO may be altered after the AO has considered the habitat values and the species present, the topographical and vegetative characteristics of the area and the type and amount of surface disturbance proposed.

Note: This stipulation is essentially the same as the Continuation of Current Management version, but was modified slightly to specifically identify the river corridors affected (including the Piney), to expand on the values provided by these river corridors and to clarify the way in which exceptions would be evaluated.

4. Garfield Creek, Basalt, and West Rifle Creek State Wildlife Areas. Protection of wildlife habitat values for which these areas were acquired by the state, including crucial big game and upland game winter habitat and concentration areas and riparian values.

Exception criteria include special mitigative measures developed in consultation with the Colorado Division of Wildlife.

Note: This stipulation is essentially the same as the Continuation of Current Management version, but was modified slightly to clarify the operation of the exception.

5. Rifle Falls and Glenwood Springs Fish Hatcheries. Protection of the quality and quantity of surface water and underground aquifers supplying the Rifle Falls and Glenwood Springs Fish Hatcheries within a two-mile radius of the hatcheries.

Exception criteria include special mitigative measures developed in consultation with the Colorado Division of Wildlife.

Note: This stipulation is essentially the same as the Continuation of Current Management version, but was modified slightly to clarify the protection of underground aquifers as well as surface waters.

6. Grouse (includes sage grouse, Columbian sharptailed, lesser and greater prairie chicken). NSO within one-quarter mile radius of a lek site (courtship area).

Exception: The NSO area may be altered depending upon the active status of the lek or the geographical relationship to the lek site of topographical barriers and vegetation screening.

7. Raptors (includes golden eagle and osprey; all accipiters; falcons, except kestrel; buteos; and owls). Raptors that are listed and protected by the Endangered Species Act are addressed separately. NSO within one-eighth mile radius of a nest site.

Exception: The NSO area may be altered depending on the active status of the nest site or the geographical relationship to the nest site of topographic barriers and vegetation screening.

8. Bald Eagle. NSO within one-quarter mile radius of the roost or nest site.

Exception: For roost sites, the NSO applies to the essential features of the winter roost site complex. After Section 7 consultation with the U.S. Fish and Wildlife Service, the NSO area may be altered, depending on the active status of the roost or the geographical relationship of topographic barriers and vegetation screening to the roost site.

Note: This stipulation is essentially the same as the Continuation of Current Management version, but was modified slightly to indicate the need for Section 7 consultation.

9. Peregrine Falcon. NSO within one-quarter mile radius of cliff nesting complex.

Exception: After Section 7 consultation with the US Fish and Wildlife Service, exceptions may be permitted.

Note: This stipulation is essentially the same as the Continuation of Current Management version but was modified slightly to indicate the need for Section 7 consultation.

10. Mexican Spotted Owl. NSO within one-quarter mile radius of a roost or nest site.

Exception: After Section 7 consultation with the US Fish and Wildlife Service, exceptions may be permitted.

Note: This stipulation is essentially the same as the Continuation of Current Management version but was modified slightly to indicate the need for Section 7 consultation.

11. Wildlife Seclusion Areas. NSO within fourteen seclusion areas that provide high wildlife value. Eight are in GMU 32: Roan Cliffs, Cottonwood Gulch, and Webster Hill/ Yellowslide Gulch (all in the NOSR Production Area); Hayes Gulch; Riley and Starkey Gulch; Riley Gulch; Crawford Gulch; and Magpie Gulch. Six are in GMU 42: Paradise Creek, Coal Ridge, Lower Garfield, Jackson Gulch, Bald Mountain, and Battlement Mesa.

No exceptions are permitted.

12. Special Status Species. NSO on the habitat of those species listed as, or proposed, or candidates for listing as Threatened or Endangered by the federal or state government. Habitat areas include occupied habitat and habitat necessary for the maintenance or recovery of the species.

Exception: Disturbance in the habitat area may be permitted after the AO has considered the type and amount of disturbance, species population density, the relative abundance of the habitat, and other related factors. Section 7 consultation with the U.S. Fish and Wildlife Service would be required on Threatened or Endangered Species. Consultation with Colorado Division of Wildlife would be required for state listed species.

13. Domestic Watershed Areas. Protection of municipal watersheds providing domestic water for the communities of Rifle and New Castle.

Exception: Activity may be permitted if the AO determines, in consultation with the communities of Rifle and New Castle, that the applicant's proposal would produce only a negligible decrease in water quality.

Note: This stipulation is essentially the same as the Continuation of Current Management version, but was included with the Critical Watershed NSO. It was modified slightly to clarify the operation of the exception.

14. Debris Flow Hazard Zones. NSO for the protection of the Glenwood Springs debris flow zones.

Exception: Activity may be permitted by the AO in consultation with the City of Glenwood Springs and Garfield County, provided that the applicant's proposal will produce only a negligible increase in the risk of debris flow.

Note: This stipulation is essentially the same as the Continuation of Current Management version, but was included with the Critical Watershed NSO. It was modified slightly to clarify the operation of the exception.

15. Steep Slopes. NSO on slopes greater than 35 percent to minimize impacts on site productivity, adequately control surface runoff, reduce accelerated erosion and increase likelihood of successful reclamation.

Exception: The Authorized Officer may make exceptions for short stretches of road or small portions of a pad. The NSO does not apply to pipelines.

16. Special Recreation Management Areas (SRMAs). For the protection of recreational values, visual resources and cave resources, the following areas will be stipulated NSO.

- Deep Creek ACEC/SRMA
- Bull Gulch ACEC/SRMA
- Thompson Creek ACEC/SRMA
- Hack Lake SRMA
- Rifle Mountain Park

No exceptions are permitted in any of these areas.

Note: This stipulation combines NSO stipulations 11 (Deep Creek), 12 (Bull Gulch), 13 (Thompson Creek), 14 (Hack Lake), and 15 (Rifle Mountain Park) from the Continuation of Current Management Alternative and clarifies the exception criteria.

17. Non-motorized Recreation Management Areas. For the protection of non-motorized recreational values, the following areas will be stipulated NSO.

- Sunlight Peak Area
- King Mountain Area
- Haff Ranch
- Siloam Springs Area

- Castle Peak Area
- Pisgah Mountain Area

Exception: Existing roads in these areas may be used for oil and gas drilling and maintenance operations.

Note: The Sunlight Peak Area was listed as NSO 16 in the Continuation of Current Management Alternative.

18. Colorado and Eagle Rivers SRMAs. NSO required to protect recreational and visual values.

Exception criteria include mitigating measures to screen operations from scenic viewsheds, make drill rig and other equipment noise unnoticeable at a distance, protect recreating public from operations, and restore disturbed areas to a condition substantially unnoticeable to the casual observer.

19. Sensitive Viewsheds. NSO on slopes over 25 percent with high visual sensitivity in the Interstate 70 viewshed.

Exceptions would be granted if proposed occupancy is effectively out of view, is of very low visual contrast, is generally not noticeable and does not attract attention. These criteria all depend on the established character of the surrounding landscape.

20. Roan Cliffs Scenic Area. NSO to protect the scenic quality of the Roan Cliffs.

Exceptions would be granted if proposed occupancy is effectively out of view, is of very low visual contrast, is generally not noticeable and does not attract attention. These criteria all depend on the established character of the surrounding landscape.

B. Timing Limitation Stipulations (TL)

1. Big Game Winter Habitat (includes mule deer, elk, pronghorn antelope and bighorn sheep). Protection of winter habitat which includes severe big game winter range and other high value winter habitat as mapped by the CDOW.

- Big Game Winter Habitat - December 1 to April 30.

Exception: Under mild winter conditions, the last 60 days of the seasonal limitation period may be suspended after consultation with the CDOW. Severity of the winter will be determined on the basis of snow depth, snow crusting, daily mean temperatures, and whether animals were concentrated on the winter range during the winter months. This limitation may apply to work requiring a Sundry Notice pending environmental analysis of any operational or production aspects.

2. Big Game Birthing Areas.

- Elk Calving -April 16 to June 30
- Pronghorn antelope fawning - May 1 to July 15
- Rocky Mountain Bighorn Sheep Lambing - May 1 to July 15
- Desert Bighorn Sheep Lambing - March 16 to May 30

Exception for Big Game Birthing Areas: When it is determined through a site-specific environmental analysis that actions would not interfere with critical habitat function or compromise animal conditions within the project vicinity, the restriction may be altered or removed.

3. Grouse crucial winter habitat and nesting habitat (includes sage grouse, Columbian sharp-tailed, and lesser and greater prairie chickens). Sage grouse nesting habitat is described as sagebrush stands with sagebrush plants between 30 and 100 centimeters in height and a mean canopy cover between 15 and 40 percent within a two mile radius of an active lek.

- Sage grouse crucial winter habitat - December 16 to March 15.
- Sage grouse nesting habitat - March 1 to June 30.

No exceptions are permitted for winter habitat.

Exceptions for nesting habitat: During years when the lek is inactive and it is determined that there is no nesting activity occurring by May 15, the seasonal limitation may be suspended.

Note: This stipulation was modified by the addition of the provision for sage grouse nesting habitat, which is a lease notice in the Continuation of Current Management Alternative.

4. Greater Sandhill Crane nesting and staging areas - March 1 to October 16.

No exceptions identified.

5. White Pelican nesting and feeding habitat areas - March 16 to September 30.

No exceptions identified.

6. Raptor nesting and fledgling habitat (includes the golden eagle and all accipiters; falcons, except the kestrel; all buteos; and owls). Raptors that are listed and protected by the Endangered Species Act are addressed separately. A one-quarter mile buffer zone around the nest site from February 1 to August 15.

7. Ferruginous Hawk nesting and fledgling habitat. A one-mile buffer zone from February 1 to August 15 to avoid nest abandonment.

8. Osprey nesting and fledgling habitat. A one-half mile buffer zone from April 1 to August 31 to avoid nest abandonment.

Exception for raptor, ferruginous hawk and osprey (6, 7 and 8 above) nesting and fledgling habitat: During years when a nest site is unoccupied or unoccupied by or after May 15, the seasonal limitation may be suspended. It may also be suspended once the young have fledged and dispersed from the nest.

9. Mexican Spotted Owl nesting and fledgling habitat - February 1 to July 31.

The average Mexican spotted owl territory is estimated to encompass approximately 2,000 acres. Within this area, Primary Activity Centers (PACs) are defined around nesting, feeding, and roosting areas within the territory. These PAC's are mapped as a one-half mile radius (600 acre) area around nests, roosts and the center of feeding areas and are not considered to be overlapping. With multiple sightings of the Mexican spotted owl but with no confirmed nest or roost sites, a PAC is defined as the area where habitat is used the most.

Exceptions may be identified after formal Section 7 consultation with the U.S. Fish and Wildlife Service.

Note: This stipulation is essentially the same as the Continuation of Current Management version, but was modified slightly to indicate the need for Section 7 consultation and to update the habitat description.

10. Bald Eagle Nest Site. A one-half mile buffer zone around the nest site is required to prevent disruption of nesting from December 15 to June 15.

Exceptions may be identified after formal Section 7 consultation with the U.S. Fish and Wildlife Service. The limitation may be suspended in years when the nest site is unoccupied by May 15 or once the young have fledged and dispersed from the nest.

Note: This stipulation is essentially the same as the Continuation of Current Management version but was modified slightly to indicate the need for Section 7 consultation and to update the habitat description.

11. Bald Eagle Winter Roost Site. A one-half mile buffer area around the roost site to avoid relocation to less suitable areas is required from November 16 to April 15.

Exceptions may be identified after formal Section 7 consultation with the U.S. Fish and Wildlife Service. If there is partial or complete visual screening of the area of activity, the roost site may be reduced to one-quarter mile.

Note: This stipulation is essentially the same as the Continuation of Current Management version but was modified slightly to indicate the need for Section 7 consultation.

12. Peregrine Falcon. A one-half mile buffer area around the cliff nesting complex from March 16 to July 31 to prevent abandonment and desertion of established territories.

Exceptions may be identified after formal Section 7 consultation with the U.S. Fish and Wildlife Service. The limitation may be suspended in years when the nest site is unoccupied by May 15 or once the young have fledged and dispersed from the nest.

Note: This stipulation is essentially the same as the Continuation of Current Management version but was modified slightly to indicate the need for Section 7 consultation.

13. Waterfowl and Shorebird Nesting Areas. This stipulation protects nesting ducks from April 15 to July 15 in a one-quarter mile buffer around the nesting and production areas of the following reservoirs: Fravert Watchable Wildlife Area, Consolidated Reservoir and the King Mountain Reservoirs - Grimes-Brooks, Nobel and Upper and Lower King Mountain.

No exceptions are permitted.

C. Controlled Surface Use (CSU) Stipulation

1. Underground Coal Mines. Within the area of federally leased coal lands, oil and gas operations will be relocated outside the area to be mined or to accommodate room and pillar mining operations. This stipulation may be waived without a plan amendment if the lessee agrees that the drilling of a well will be subject to the following conditions:

- Well must be plugged when the mine approaches within 500 feet of the well;
- Well must be plugged in accordance with Mine Safety and Health Administration (formerly Mine Enforcement and Safety Administration) Informational Report 1052; and
- Operator will provide accurate location of where the casing intercepts the coal by providing a directional and deviation survey of the well to the coal operator; ***or***
- Relocate well into a permanent pillar or outside the area to be mined. A suspension of operations and production will be considered when the well is plugged and a new well is to be drilled after mining operations move through the location.

2. Riparian and Wetlands Zones. In an area 500 feet beyond the outer edge of the riparian vegetation, activities associated with oil and gas exploration and development, including roads, transmission lines and storage facilities, may require special design, construction, and implementation measures, including relocation of operations beyond 200 meters.

3. Perennial Water Impoundments and Springs. Activities associated with oil and gas exploration and development, including roads, transmission lines and storage facilities, may be required to move to an area beyond 200 meters of the water source to prevent disruption of use by livestock and wildlife in areas having very limited water sources.

4. Sensitive Plant and Animal Species. For those species listed as sensitive by BLM, special design, construction and implementation measures, including relocation of operations by more than 200 meters, may be required. For plant species, habitat areas include occupied habitat and habitat necessary for the maintenance or recovery of the species. For animals, habitat areas are areas that are important during some portion of the lifecycle, such as nesting/ production areas or communal roost areas (nesting areas, nests and fledgling areas, dens, leks, etc.)

5. Highly Erosive Soils. Special design, construction and implementation measures may be required, including relocation of operations beyond 200 meters, in identified areas of highly erosive soils. Areas identified in the RMP as Erosion Hazard Areas are also included in this stipulation.

6. Water Quality Management Areas. CSU for areas identified as Water Quality Management Areas. To reduce erosion and sedimentation potential in watersheds identified in the GSRA RMP with water quality management concerns.

7. Site Disturbance Limit and Site Stability. On slopes greater than 25 percent, special design, construction and implementation measures, including relocation beyond 200 meters, may be required to minimize wellpad disturbance while maintaining a high probability of reclamation success. Typical wellpad size should be not more than 2.5 acres and cut and fill slopes should be on 2.5:1 slopes.

Exceptions: The AO may permit exceptions at locations where: a) the above performance objectives are met; b) it can be demonstrated that a larger disturbance is required, as for multiple well bores or deeper bores, and the GSRA reclamation objectives would be achieved; or c) it is determined that a cut slope greater than 2.5:1 would remain stable and safe (for both animals and humans) during the life of the well and additional bonding is provided to assure that the reclamation objectives will be met.

8. Sensitive Viewsheds. In order to reduce visual impacts, special design, and construction measures may be required on all lands in the I-70 viewshed and lands in the foreground and middle ground of the Battlement Mesa, Holms Mesa and Rifle and Highway 13 viewsheds. This CSU does not include relocation of operations more than 200 meters.

9. Visual Resource Management (VRM) Class II and III Areas. Special design, construction and implementation measures, including relocation beyond 200 meters, may be required in Class II areas to assure that the site is substantially unnoticeable to the casual observer. Moves greater than 200 meters would not be required in Class III areas.

10. Sharrard Park Paleontological Area. Special design, construction and implementation measures, including relocation beyond 200 meters, may be required to adequately mitigate the impacts on two scientifically important areas.

D. Lease Notices

1. Class I and II Paleontological Areas. An inventory shall be conducted by an accredited paleontologist approved by the AO prior to surface-disturbing activities in these areas.

2. Special Status Species Areas. In areas of known or suspected habitat of special status plant or animal species, a biological inventory will be required prior to approval of operations. The inventory would be used to prepare mitigating

measures to reduce the impacts of surface disturbance on the special status species. These mitigating measures may include, but are not limited to, relocation of roads, wellpads, pipelines, and other facilities, and fencing operations or habitat.
Given the high potential for special status species to occur in the NOSR Production Area, it is likely that a biological inventory will be required for most of that area prior to development activities.

Note: This lease notice is essentially the same as the Continuation of Current Management version but was modified slightly to change the descriptor from "sensitive" to "special status" species.

3. Annual Reports of Reclamation Progress. All lessees in the GSRA are required to report to the AO annually on the ongoing progress of reclamation at locations developed on the lease. (See Appendix I of the Draft SEIS.)

4. Emergency Communications Plan. The operator is required to prepare and maintain a current emergency communications plan. The plan shall be provided to the BLM, Colorado State Patrol, Garfield County and affected communities. The plan shall be made available to the general public upon request. The plan shall contain: information sufficient to describe the potential for emergency incidents related to oil and gas development which pose an immediate danger to human health and safety and would normally require immediate actions by the operator to remove the threat, such as for hazardous materials spills; actions to be taken by the operator in the event of such an incident; and a communications plan to inform appropriate authorities and potentially affected citizens.

5. Wildlife and Wildlife Habitat. The operator is required, in consultation with BLM and the Colorado Division of Wildlife (CDOW), to develop and implement specific measures to reduce impacts of oil and gas operations on wildlife and wildlife habitat. Such measures shall be submitted to the BLM in conjunction with preparation of APDs and/or Plans of Development (PODs). Such measures may include completing habitat improvement projects designed to replace habitat lost through construction activities; reducing human disturbance to wildlife in important habitat areas during critical times of the year by installing gates and closing roads, using telemetry to collect well data and accessing well site locations during the times of the day when wildlife is not likely to be present in the area. It is recognized that other measures may be appropriate and that not all measures would be appropriate for all areas. As such, this measure is best implemented through PODs addressing several years' activity in an area.

6. Working in Wildlife Habitat. The operator is encouraged to work with the CDOW to establish a set of reasonable operating procedures for employees and contractors working in important wildlife habitats. Such procedures would be designed to inform employees and contractors on ways to minimize the effect of their presence on wildlife and wildlife habitats. Procedures might address items such as working in bear country, controlling dogs, and understanding and abiding by hunting and firearm regulations.

7. Working in Residential Areas. The operator is required to consider the impact of operations on nearby communities and residences, and will be expected to reasonably adjust operating procedures to accommodate local residential concerns. For example, the operator will be expected to try to work out reasonable compromises to related issues such as noise, dust, and traffic. The operator will be expected to address such issues when raised during public comment periods associated with preparation of environmental assessments or as complaints are reported to the operator, the BLM or the COGCC.

8. Anvil Points Landfill. Any operations within the Anvil Points landfill area owned by Garfield

County shall be consistent with the terms and conditions established in EA-CO-078-5-31.

9. Project Rulison Monitoring. All wells located within three miles of Project Rulison shall be subject to oversight measures adopted by the Colorado Oil and Gas Conservation Commission (COGCC). Generally, APDs for such wells will be reviewed by the Department of Energy (DOE) for consideration if such wells should be incorporated into DOE's regular monitoring program.

Appendix D

CONDITIONS OF APPROVAL COMMON TO ALL ALTERNATIVES

I. Introduction

All Applications for Permits to Drill (APD) are reviewed to ensure conformance with the RMP and are subject to a site-specific environmental assessment (EA). Through the EA process, which includes field reviews of the proposed well, road and pipeline locations, mitigative measures are developed to reduce the adverse impacts associated with oil and gas development activities as much as possible, but consistent with lease rights granted. If the mitigation is not already included in the APD, BLM will apply them as Conditions of Approval (COA). They are developed on a case-by-case basis to address site-specific issues. COAs do not have to be approved in advance or included in the RMP, the FEIS or this SEIS for application. If not already included in the operations plan of the APD, any mitigation measure which is consistent with the lease rights granted and the guidance set forth in this plan and subsequent amendments is available to the Authorized Officer (AO) for use as a COA.

II. Conditions of Approval

The FEIS (Appendix D) contains a listing of many common COAs. That list will not be repeated here. Only COAs commonly used since the FEIS or modifications of the COAs in the FEIS are shown. There is no commitment to specific wording for a COA and the Appendix is not intended to limit the development of additional COAs if needed. The following COAs apply under all alternatives.

1. Notification

The operator or his contractor will contact the GSRA 48 hours before beginning any work on public land. A pre-construction conference with the earth-moving contractor is required at the time of notification. The operator shall inform the AO on a weekly basis during construction as to the status of the project.

The operator or his contractor will contact the GSRA 48 hours before starting reclamation work and within 48 hours of completion of reclamation work.

2. Big Game Habitat

To protect crucial big game winter range on leases without timing restrictions, construction and drilling activities are prohibited from January 1 through February 28. The time period could be modified or waived after a determination by the AO that the specific habitat is not being used by mule deer, or that weather conditions are moderate, or that impacts can be mitigated to avoid abandonment of the winter range.

Any activity, structure or disturbance proposed within big game migration corridors shall be implemented in such a manner that migration activities will not be disrupted or precluded.

3. Construction

Approval may be subject to the additional measures determined at the on-site exam, such as the following examples that are site specific and have been used on various APDs:

a. During construction of the access road, sidecast material will be kept to a minimum by end-hauling the material.

b. Trees and slash will be broken up and placed at the toe of the fill slope to help contain the fill.

c. Construction designs will be modified to prevent placement of fill material in the adjacent drainage, reduce the amount of fill, prevent impacts to the sensitive plants, or to protect cultural resources.

d. An interim reclamation and facilities design will be submitted and approved by the AO prior to installation of the pipeline and facilities.

e. Culverts will be installed at the elevation of the natural streambed. The length of the culvert will be sufficient to extend past fill material. The fill slopes of both the upstream and downstream sides of the culvert will be riprapped with a well graded mixture of rock sizes to prevent erosion or headcutting of the fillslopes. Installation of wings on the up and down stream ends of the culvert may be used in place of the riprap. The fill material placed over the culvert will be compacted in six inch lifts and will be a depth of at least half the diameter of the culvert.

f. All cattle guards shall conform to BLM design and specifications. At each cattle guard a bypass gate shall also be constructed in accordance with BLM design and specifications.

4. Reserve Pits

The reserve pit shall be reclaimed as early as possible after completion activities or when no longer needed. Earliest reclamation of the pit would be required the same year as construction if the pit has had 90 days to evaporate through the period of May 1 to September 30. This is to ensure that re-vegetation can begin with the first available growing season after initial construction of the wellpad. If reclamation of the pit is not feasible during the first year of construction, the reserve pit would be reclaimed the subsequent year the pit is no longer needed. There will be a minimum of three feet of cover (overburden) on the pit. When work is complete, the pit area will support the weight of heavy equipment without sinking.

5. Pipelines

Surface pipelines will be uncoated steel so as to blend into the visual background.

6. Drilling

All operations, unless otherwise specifically approved in the APD, must be conducted in accordance with Onshore Oil and Gas Order No. 2; Drilling Operations.

The operator shall contact the AO at least 24 hours prior to running the surface and production casing and conducting the BOP test.

Any usable water zones encountered below the surface casing shall be isolated and protected by cementing across the zone. The minimum requirement is to cement from 50 feet above to 50 feet below each usable water zone encountered.

All open-vent exhaust stacks associated with heater-treater, separator, and dehydrator units must be constructed to prevent birds and bats from entering them and to the extent practical to discourage perching and nesting.

Approval of this application does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease which would entitle the applicant to conduct operations thereon.

Surface casing must be set to a depth of at least 300 feet, except in the overpressure zone (see Chapter 3 and 4, Groundwater), where casing must be set to a depth of 1,100 feet.

All permanent on-site structures will be painted a flat, non-reflective earth tone.

The production facilities will be placed on the pad to allow for reshaping and backfilling the cut and fill slopes.

7. Reclamation

All surface disturbance will be recontoured and revegetated according to an approved reclamation plan. Reclamation will be considered successful when the objectives described in the GSRA Reclamation Policy (see Appendix I of the Draft SEIS) are achieved. The policy is generally implemented, in part, with the following COAs:

- All disturbed areas not necessary for drilling and producing operations will undergo reclamation activities after completing dirtwork and construction operations. Specifically, if the well is a producer, the surface area of the drill pad not needed for facilities or operations and unused portions of the road will be reclaimed according to the standards of the reclamation policy. If the well is not a producer and is plugged in, those standards will also apply to final reclamation.

- All compacted portions of the pad, road, and pipeline route will be ripped to a depth of 18 inches unless in solid rock. Prior to seeding, stockpiled topsoil (stripped surface material) will be spread to a uniform depth that will allow the establishment of desirable vegetation. All unused disturbed areas will be seeded within 24 hours after completing dirt work unless a change is requested by the operator and approved by the AO. If the seed bed has begun to crust over or seal, the seed bed must be prepared by disking or some other mechanical means sufficient to allow penetration of the seed into the soil. In addition, the broadcast seed should be covered by using a harrow, drag bar, or chain.

- Recontouring. The unused disturbed areas surrounding the well location and along the road will be re-contoured to blend as nearly possible with the natural topography. Final grading of back-filled and cut slopes will be done to prevent erosion and encourage establishment of vegetation.

- Bonding. Additional bonding could be required for sites with extremely difficult reclamation conditions or if repeated reclamation attempts have been unsuccessful. This is more likely to occur under the following conditions: the wellpad cannot be substantially reduced in size for production facilities and the majority of reclamation (reshaping and revegetation) would not occur until the well is plugged and abandoned; large cut slopes (over 20 feet) are left on the wellpad for the life of the pad; final reclamation could not be completed with standard reclamation measures as documented in the site specific environmental analysis; and, it is determined that the nationwide bond is inadequate.

- Topsoil will be stripped to a minimum depth of six inches. Topsoil storage piles will be no deeper than three to four feet. If topsoil is less than six inches, the top six inches of surface material will be stripped and piled as described. The topsoil and/or surface piles will be seeded within 24 hrs of stockpiling.

- The operator will implement measures prior to seeding the disturbed areas and after completion of the well, to enhance the productivity of the growth medium (re-distributed cut and fill soils) and the establishment of the seeded species. The type of treatment will be included in the reclamation report to be submitted to the AO. This requirement can be exempted if a soil test is conducted and the soil has sufficient nutrients and organic matter capable of supporting the seeded species.

  The cut and fill slopes will be protected against rilling and erosion with measures such as water bars, lateral furrows, or other measures approved by the AO. Weed free straw bails or a fabric silt fence will be used at the toe of the fill slopes.

- Areas being reclaimed will be fenced to exclude livestock until the seeded species have established. The type of fencing will be approved by the AO.

- After completion activities, the operator will reduce the size of the wellpad to The minimum surface area needed for production facilities, while providing for reshaping and stabilization of cut-and-fill slopes. The cut-and-fill slopes will be reshaped to a maximum 3:1 slope. If such a slope cannot be reconstructed, the operator will demonstrate that the slopes can be stabilized and revegetated to meet the GSRA reclamation goals and objectives.

- If the reclamation potential is determined to be very low, the operator is required to modify the reclamation section of the surface use plan to demonstrate that the low potential problems can be addressed.

8. Riparian Areas

Stream crossings will be kept to the absolute minimum necessary and crossings will be located where riparian values are the lowest. At a minimum, crossings will not be located such that mature (late seral) riparian vegetation will be affected.

Depending on the amount of riparian vegetation disturbed, the AO may require the replanting of the area during the first growing season after the disturbance occurs. This may include the planting of native riparian species appropriate to the site, such as willow plugs, cottonwood poles, and clumps of herbaceous riparian species.

Installation and maintenance of sediment traps may be required to collect and settle out sediments where surface disturbance is necessary in or near perennial stream channels.

Appendix E

PROJECT RULISON

- E-1 Project Rulison
- E-2 COGCC Report

APPENDIX E-1: PROJECT RULISON

History[1]

On September 10, 1969, a 43-kiloton fission-type nuclear device was detonated at a depth of 8,426 feet in the Williams Fork Formation of the Mesaverde Group. The detonation was part of Project Plowshare, to test and evaluate the feasibility of the use of a nuclear device in a gas productive formation to fracture the rock to increase the production of gas. Project Plowshare was a program of the Atomic Energy Commission (AEC) with Austral Oil Company and was conceived to develop peaceful uses of nuclear technology.[1]

The well site is situated in Lot 11 (NE¬SW¬), Section 25, T. 7 S., R. 95 W. in Garfield County, Colorado, about 3« miles southeast of the community of Battlement Mesa. The project consisted of several phases. Phase I included the drilling of the well (Hayward A #25-95 (R-E)), gas production tests, and necessary geological, hydrological, biological, and environmental studies to ascertain technical and safety considerations, as well as establish a baseline. Phase II was the detonation of the device and recording effects of the detonation. Phase III, or post detonation evaluation consisted of drilling into the detonation (Hayward #25-95 (R-EX)) cavity and testing the well to determine cavity volume, fracture length, gas flow rates, and isotopes and levels of radioactivity within the produced gas.

The emplacement well was initially planned to be the reentry well, however gas pressure was measured in the R-E well six days after the nuclear blast. While the gas was not sampled, it was thought that it may contain radionuclides. For this reason the reentry well was directionally drilled from a location 300 feet southeast of the emplacement well.[1]

Drilling of the R-EX well was started in April of 1970. Fractures were encountered at a vertical well depth of 8,151 feet and was identified by a loss of drilling fluid circulation, increased drilling penetration rate, and the first radionuclides encountered during the drilling. These fractures indicate a fracture radius of 275 feet above the depth of the depth of nuclear detonation. Four production flow tests were carried out during the period between October 1970 and April 1971. The first observed subsurface pressure was 3,156 psi with an initial flow rate of 15 million cubic feet of gas/day, but declined to .885 million cubic feet of gas/day with a cavity pressure of 246 psi at the end of 108 days. After a shut in period of 158 days the cavity pressure had only build up to 798 psi. The reentry well produced 430 million cubic feet of gas/day during the production testing.[1]

The gas was flared or burned at the surface during the production testing phase. Testing was conducted to evaluate the extent and effectiveness of the nuclear stimulation, dimensions and geometry of the cavity and fracture system, evaluate the economic feasibility, radioactivity released, and determine if gas produced from nuclear stimulation could be used for domestic and commercial purposes.[1]

Radionuclides produced by the device detonated at Project Rulison that could potentially contaminate natural gas are primarily beta emitters, and consist of Krypton-85, Tritium, and Carbon-14. The following table is a summary of radionuclide concentration at the beginning and end of production testing:

Table E-1. Summary of Radionuclide Concentrations Before and After Testing at Rulison

Radionuclide	Radionuclide Concentration in Produced Gas at Beginning (10/70) of Production Testing in pCi/cc	Radionuclide Concentration in Produced Gas at End (4/71) of Production Testing in pCi/cc
Krypton-85	185	2.8
Tritium	185	3.3
Carbon-14	.35	.07

What this means is that, if all of the gas produced from Project Rulison were burned at the surface, the resulting concentration of radioactivity in the air within one mile of the well would be well below federal standards.[1]

The R-EX well was plugged and abandoned (P&A'd) September 11, 1976 and the original emplacement well was P&A'd October 6, 1976. Cleanup and remediation of the site was completed in 1996.[2]

The federal government holds subsurface rights to Lot 11 to control and prevent excavation, drilling, or removal of materials below a depth of 6,000 feet.

Results

AEC discontinued Project Plowshare after the third experimental detonation, Project Rio Blanco, near Rifle, Colorado. All three of the tests did not achieve the desired results for both formation stimulation and associated economic benefits. The use of nuclear devices to stimulate low permeability reservoirs, actually resulted in a significantly lower gas production then estimated. For instance, it was estimated that Project Rio Blanco would produce 26 billion cubic feet of gas (BCFG) for a period of 25 years, however post detonation testing indicated that only 1.1 BCFG would be produced.[1]

Post-detonation cavity size and fracturing was within, or close to, the pretest estimates; however, an overestimation of formation permeability appears to be a major cause of the failure of the expected stimulation results. It also appeared that new unsupported fractures created by the detonation closed soon afterward, did not extend beyond the pre-detonation estimate, and did not migrate or intersect adjacent/discontinuous sandstone reservoirs. Radioactive materials were confined within the cavity and contained within the 40-acre spacing unit of the well.[1]

Cavity size and fracture radius were calculated using a computer stimulation program that was based on 622 atmospheric and underground nuclear test detonations at the Nevada Test Site and other locations. Subsurface parameters were obtained from Mesaverde core samples, open hole electric logs and pre-detonation gas test results. Cavity radius was calculated to be 76 feet, shear fracture length of 276 feet, and the maximum fracture length was predicted to be 433 feet. A fracture was encountered at a well depth of 8,151 feet in the reentry well. The fracture was identified by a loss of circulation, increased drilling penetration rate and the first radionuclides encountered during the drilling. A cavity radius of 78 feet was calculated using Krypton-85 data. This confirmed the pre-detonation calculations and further confirmed that radioactivity produced by the test would be contained within the cavity and fracture zone.[1]

Subsequent analysis of well performance conducted by Lawrence Livermore Laboratories yielded a fracture radius of 215 feet. An independent evaluation by DeGolyer and

MacNautghton, reservoir engineering company, resulted in a radius of 220 feet. Both these analyses agree with the cavity radius of 78 feet calculated using Kyrpton-85 data and loss of circulation in the reentry well 275 feet above the detonation point.[1]

Cleanup and Restoration

The R-EX, reentry well was shut in during April 1971, and since there were no plans to commercially produce the well, the wells were plugged and abandoned (P&A) and all associated equipment removed. Both wells were P&A'd after approval by the Colorado Oil and Gas Commission and the U.S. Geological Survey, Division of Oil and Gas, in a manner to permanently isolate formations and prevent migration of water or gas.[2,3]

Stemming material in the R-E well consisted of sand and gravel and bentonite plugs for ease of reentry. Since the stemming material was determined to be inadequate for permanently plugging the well, the material was removed to a well depth of 5,954 feet. The entire well was then cemented in lieu of leaving a 3,200-foot section filled with plugging mud.[2,3]

The R-EX well was plugged as planned, except that the U.S. Geological Survey required that cement be used in the section between 5,460 and 3,000 instead of plugging mud.[2,3]

Soil contaminated with diesel fuel and heavy metals (chromium compounds) was removed from the drill rig reserve pit was removed and disposed of in a commercial facility in 1995. No radioactive materials were detected during the pit cleanup.[3]

The surface plant and all equipment were dismantled, decontaminated, released for unrestricted public use, and shipped off site to a location designated by the owner (Astral Oil Company). Material left on site included a power pole with fuse box, telephone line, a concrete slab, and a monument over the reentry well with a description of drilling restrictions. Pits and other excavations were backfilled and the drilling pads reclaimed.[3]

Off-Site Contamination Potential

The Mesaverde Formation was laid down as near-shore deposits, including coastal swamp, floodplain, and marine depositional environments. These type of deposits consists of shale and sandstone, that are discontinuous and lenticular in geometry. The sandstone reservoirs in the Meseverde represent stream, crevasse splay, tidal channel, and beach deposits. Mesaverde gas wells drilled in the area have porosity in the range of seven to eight percent permeability that ranges from .5 to .11 millidarcies, and a water saturation of between 35 to 55 percent. These parameters are typical of a tight gas reservoir, that is very fine-grained and contains no free water. The lack of free water was evidenced in the testing of the Rulison wells. Since there is no free or connate water within the Mesaverde, radionuclides are unable to migrate from the site by groundwater flow. If there was a potential for groundwater flow, the fact that the sandstones are lenticular and not connected would prevent migration.

Barrett Resources Corporation submitted an application to COGCC (February 21, 1995) for increased well density that included the Grand Valley, Parachute, and Rulison areas. The application included geologic and engineering data sufficient to justify well spacing of 40 acres or less. Outcrop studies and subsurface evaluations demonstrated that the Mesaverde reservoirs are heterogeneous (occur in discrete compartments), have low permeability and porosity, and that reservoir modeling indicates that increased well density is necessary to effectively drain the current spacing units. This information illustrated that gas wells drain less than 40-acres. It stands to reason, that the potential for migration of radioactive materials in natural gas would not laterally migrate outside of the quarter-quarter (Lot 11) section of land containing the Rulison well.

Aquifers in the Rulison area are the alluvial and terrace deposits on and near the surface. The underlying formations including the Green River and Wasatch Formations are for the most part impermeable and do not typically produce water[4], while the deeper Mesaverde contains 35 to 55 percent water saturation, the water is not mobile[5] and supports the conclusion that radionuclide transport by groundwater flow is not possible and that if it were possible, transport of them would be contained within Lot 11.[6]

Natural gas samples from five producing wells near the Rulison test site were analyzed for radiation by Lawrence Livermore National Laboratory. The wells were sampled during the summer of 1976 by DOE. Radiation analysis of the samples for Tritium, Carbon-14, and Krypton were below detection limit. Analysis of all three combined were low enough to confirm that there was no radioactivity in the gas.[7]

Gas samples were taken from five Mesaverde gas wells that varied in distance of from 2.75 to 7 miles from the Project Rulison wells. The radiation analysis was conducted by the Lawrence Livermore National Laboratory. DOE requested that Tritium, Carbon-14, and Krypton be analyzed individually, however the levels were below detection limits and they were analyzed together. The combined analysis resulted in that there was no radioactivity in the gas.[8,9]

COGCC committed to notifying DOE whenever a natural gas well is permitted within a three mile radius of Project Rulison to provide them the opportunity to sample completed wells for radioactivity. If radioactivity were to be detected in any wells in the area, COGCC and BLM, within their respective jurisdictions could that the wells be shut in. While there is no known potential for radionuclides to migrate from Project Rulison, the sampling program is a reasonable response to the public concern about the project.

Summary

Extensive pre- and post-detonation technical studies and evaluations, as well as site cleanup and remediation, and monitoring indicates that any radionuclides that may be present are contained within the chimney cavity and fracture zone.

The drilling of natural gas wells should not be prohibited outside of Lot 11 (NE¬SW¬), Section 25, T. 7 S., R. 95 W. In Garfield County, the site of Project Rulison. The probability of radionuclides migrating from the chimney cavity and fracture zone created by the nuclear detonation is extremely low. This is due to the limited chimney cavity and fracture zone radius, the lenticular geometry of the Williams Fork sandstones, as well as their low permeability and porosity, [1] and the lack of contaminated gas left in the cavity and fracture zone.

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[1] U.S Atomic Energy Commission Nevada Operations Office, 1973, *Project Rulison: Manager's Report*, 247 p.

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[3] U.S Atomic Energy Commission Nevada Operations Office, 1973, *Project Rulison: Site Cleanup Report*, 21 p.

[4] Reynold, M. Jr., Bray, B.G., and Mann, R.L., 1970, Project Rulison: A preliminary report, in *American Nuclear Society*, 1970 symposium on engineering with Nuclear Explosives, pp 597-628.

[5] Nork, W.E. and Fenske, P.R., 1970, *Radioactivity in Water - Project Rulison*, Teledyne Isotopes, Palo Alto, California, NVO-1229-131.

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[7] Hudson, B, 1997, Report on analysis of natural gas samples for radioactivity: Lawrence Livermore National laboratory.

[8] Department of Energy, 1997, DOE releases Rulison Site Gas Analysis, Press Release.

APPENDIX E-2: COGCC REPORT

STATE OF COLORADO
OIL & GAS
CONSERVATION COMMISSION

DEPARTMENT OF NATURAL RESOURCES
Roy Romer, Governor
1120 Lincoln St., Suite 801
Denver, CO 80203
Phone: (303) 894-2100
FAX: (303) 894-2109
Website: www.dnr.state.co.us/oil-gas

May 5, 1998

Michael S. Mottice
Area Manager
Bureau of Land Management
Glenwood Springs Resource Area
P.O. Box 1009
Glenwood Springs, Colorado 81602

Re: Project Rulison Research Summary and Conclusions

Dear Mr. Mottice,

As you requested, attached is a summary of our research into the Project Rulison nuclear natural gas stimulation experiment for your use in the preparation of the Glenwood Springs Resource Area Supplemental Environmental Impact Statement. Thank you for providing us with the opportunity to provide input into this project.

The research was conducted by the COGCC to ensure that our decisions regarding permitting of natural gas wells in the Battlement Mesa area near Project Rulison would ensure the protection of public health, safety, and welfare.

The following are our conclusions:

1.) The drilling of natural gas wells should not be permitted inside of the "Lot 11" quarter-quarter section of land containing the Project Rulison emplacement well (see the attached annotated well survey plat.) Natural gas well drilling should be permitted outside of that area. This conclusion is based on the extremely low probability of encountering gas with radiation activity due to the limited radius of the chimney cavity and fracture zone created by the nuclear detonation, the limited areal extent of the sandstone lenses within the Williams Fork Formation, and the lack of remaining contaminated gas following the extensive production testing of the re-entry well in 1970 and 1971.

DEPARTMENT OF NATURAL RESOURCES: James S. Lochhead, Executive Director
COGCC COMMISSION: Caroline Blackwell • Allan Heinle • Bruce Johnson • Mike Matheson • Claudia Rebne • Molly Sommerville • Stephen Sonnenberg
COGCC STAFF: Richard T. Griebling, Director • Brian J. Macke, Deputy Director • Morris Bell, Manager of Engineering
Patricia C. Beaver, Manager, Environmental & Commission Affairs• Marnan Peacock, Manager of Information

2.) The COGCC will continue its program of notifying the U.S. Department of Energy Nevada Operations Office when applications for Permits to Drill are received for any well penetrating the Williams Fork formation within a three mile radius of Project Rulison. This will provide the DOE with the opportunity to take gas and fluid samples for radionuclide analysis at these wells during drilling, completion and production operations if they determine that it would to be appropriate to address continuing public concern.

3.) In the extremely remote event that radionuclides are ever detected through sample analysis, the appropriate wells could be ordered shut in by the COGCC and the BLM in their respective jurisdictions, and work could be commenced to more fully assess the situation.

Thank you again for allowing us to provide these comments. Please let me know if we can be of further assistance.

Sincerely,

Brian J. Macke
Deputy Director

cc: Rich Griebling - COGCC
COGCC Commissioners
Sen. Tilman Bishop
Rep. Russell George
Garfield County Commissioners
Peter Sanders - DOE
Steve Moore - BLM
Kermit Weatherbee - BLM
COGA
RMOGA
IPAMS
Battlement Mesa Oil and Gas Committee
Grand Valley Citizens Alliance

STATE OF
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CONSERVATION COMMISSION

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PROJECT RULISON STUDY
COLORADO OIL AND GAS CONSERVATION COMMISSION

Brian J. Macke - May 5, 1998

Project Rulison was a part of the Atomic Energy Commission's Project Plowshare, which was designed to develop peaceful uses of nuclear explosive technology. The joint Atomic Energy Commission (now Department of Energy) and Austral Oil Company project was a nuclear gas stimulation experiment which took place in Garfield County near Rulison, Colorado on September 10, 1969. The experiment was conducted to test the technical and economic feasibility of detonating a nuclear explosive device in tight natural gas bearing rock formations to increase natural gas production.

During the experiment, a 43 kiloton fission-type nuclear explosive device was detonated at a depth of 8,426 feet within the Williams Fork geologic formation in the Mesaverde Group, which consists of thick sequences of tight, natural gas bearing sandstone bodies with limited areal extent. The experiment was the deepest nuclear detonation ever performed in the United States. The nuclear explosion produced a zone of fractured rock and a "chimney" of rock rubble around and above the detonation point. Because of extensive data regarding the extent of the chimney and fractures created by the nuclear explosion which was acquired by drilling a re-entry well into the chimney, the United States federal government has prohibited all drilling below 6,000 feet within the "Lot 11" quarter-quarter section of land containing the Project Rulison emplacement well (see attached annotated well survey plat.)

At the time of the experiment, there was a considerable amount of public concern about the project by environmental protection groups. In the nearly thirty years since the project, the Grand Valley area surrounding Project Rulison has experienced dramatic growth in both population and natural gas development. Because natural gas development is occurring within a few miles of Project Rulison, some members of the public are now concerned that natural gas wells could be drilled into rock formations contaminated with residual radioactive materials from the nuclear detonation and release the materials, threatening public health and safety.

Because of this concern, the Colorado Oil and Gas Conservation Commission (COGCC) representatives have discussed Project Rulison with scientists from the Department of Energy and natural gas well operators in the Rulison area, and have performed a literature search about Project Rulison. The purpose of this study has been to determine what restrictions should be placed on the drilling of natural gas wells into the Williams Fork Formation in the vicinity.

DEPARTMENT OF NATURAL RESOURCES: James S. Lochhead, Executive Director
COGCC COMMISSION: Caroline Blackwell • Allan Heinle • Bruce Johnson • Mike Matheson • Claudia Rebne • Molly Sommerville • Stephen Sonnenberg
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Patricia C. Beaver, Manager, Environmental & Commission Affairs• Marnan Peacock, Manager of Information

Extent of Chimney Cavity Formation and Fracturing from Project Rulison

When an underground nuclear device is detonated, a supersonic shock wave moves out radially, vaporizing, melting, crushing, cracking, and displacing the rock. After the initial discharge of energy, the shock wave becomes elastic and vaporized rock expands to form a spherical cavity. Subsequent heat losses, gas leak-off through the fracture system, and vapor condensation reduce the pressure until the fractured rock above the cavity can no longer be supported. Rock collapses into the cavity and forms a complex chimney-rubble zone. Collapse continues until an arch forms with sufficient strength to withstand the load of the overlying rock, or until the rubble zone in the chimney can support it.[1]

The Department of Energy has collected data for cavity radius and fracture radius from 921 underground nuclear tests in Nevada.[2] From this data, the various features of postshot geometry can be readily calculated as a function of detonation yield, depth of burial, and physical properties of rock using empirical equations developed from this large amount of data. For Project Rulison, the predicted cavity radius was a maximum of 108 feet, and the predicted fracturing radius was a maximum of 580 feet.[3]

The Project Rulison nuclear explosive device was detonated on September 10, 1969 in the Hayward #25-95 (R-E) emplacement well located in the NE¼SE¼ Section 25, Township 7 South, Range 95 West, 6th P.M. in Garfield County in the Williams Fork Formation at a depth of 8,426 feet . Re-entry operations were performed through a separate directionally drilled re-entry well, the Hayward #25-95 (R-EX) well, which had a surface location 300 feet southeast of the emplacement well. The re-entry well, which was completed in July, 1970, was designed to production test the zones stimulated by the nuclear device detonation.[4]

The re-entry well penetrated a fractured zone at a true vertical depth of 8,151 feet below the surface of the emplacement well, and experienced a complete loss of drilling fluid returns upon this encounter. Based on the rapid increase in penetration rate observed in the re-entry well between the depths of 8,151 feet and 8,234 feet which was accompanied by loss of drilling fluid returns, it is believed that effective communication with the chimney fracture environment was achieved.[3] **The fractures encountered by the re-entry well indicate a fracturing distance of 275 feet vertically above the depth of the nuclear device detonation.**

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[1] "Current Status of Projects Gasbuggy, Rulison, and Rio Blanco and an Appraisal of Nuclear-Explosive Fracturing Potential for the Near Future" J.J. Stosur, July 1976

[2] Comments made by Peter Sanders, U.S. Department of Energy Environmental Restoration Geologist at a public meeting in Battlement Mesa, Colorado on August 18, 1997.

[3] "The Nuclear Stimulation of a Natural Gas Reservoir" W.G. Frank, Austral Oil Company Incorporated

[4] "Project Rulison Well Plugging and Site Abandonment Plan" United States Energy Research and Development Administration, Nevada Operations Office, August, 1976

Wellbore design provisions and plugging and abandonment operations have vertically isolated the chimney cavity and fracture zone to protect shallower geologic formations, groundwater, and the surface.

An extensive series of shut in pressure build-up and production flow testing was performed to provide data to determine chimney cavity and fracture geometry, permeability of the fracture zone and unstimulated reservoir rock, and the long term capability of the well to produce gas. The well was flow tested at rates from 1 million cubic feet of gas per day to 15 million cubic feet of gas per day during three separate flow periods between October 1970 until April 1971. Pressure and temperature measurements were also recorded during a final shut-in period which ended in September, 1971. During the production testing data concerning surface wellhead pressures, temperatures, separator gas gravity, and gas condensate and water production were recorded. In addition, subsurface pressure and temperature measurements were made at various times as conditions permitted. During the production testing samples of gas were collected and analyzed for composition analysis.[5]

The data gathered during the shut-in and production tests were entered into a sophisticated mathematical reservoir model to simulate the performance of the Rulison R-EX re-entry well. The model was constructed and operated by Computer Technical Services, Inc., of Dallas Texas, and the interpretations of the test data were made jointly by that firm and the respected reservoir engineering firm of DeGolyer and McNaughton.[5]

Using the reservoir model to obtain a history match of the observed pressure and production data, the following perameters were calculated: [5]

Chimney Cavity Radius	**74 Feet**
Outer Radius of the Fracture Zone	**220 Feet**

Another model calculation referenced in the United States Atomic Energy Commission Nevada Operations Office Project Rulison Manager's Report found the chimney cavity radius to be 76 feet and the outer radius of the fracture zone to be 213 feet. In addition, simple pressure-volume-temperature analysis of bottom-hole pressures measured during the second production flow test indicate a chimney cavity radius of approximately 76 feet, which helps to confirm the accuracy of the model calculations.[6] The attached annotated well survey plat depicts the calculated chimney cavity radius, the fracture zone radius, and the "Lot 11" quarter-quarter section restricted from natural gas drilling. It is important to note that the distance from the emplacement well to the nearest Lot 11 boundary exceeds double the calculated fracture zone radius.

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[5] "Report on Interpretation of Test Data from Project Rulison in the Rulison Field, Garfield County, Colorado", DeGolyer and McNaughton, December, 1971

[6] "Project Rulison Manager's Report", United States Atomic Energy Commission Nevada Operations Office, April 1973

The conclusion drawn from this information is that the chimney cavity and fracture zone created by Project Rulison in the Williams Fork Formation are horizontally isolated within the "Lot 11" quarter-quarter section of land containing the Project Rulison emplacement well.

Colorado Oil and Gas Conservation Commission Williams Fork Formation Well Density Orders

The Colorado Oil and Gas Conservation Commission (COGCC) approved a request in July, 1997 to allow 40 acre well density for the Williams Fork Formation in the Mesaverde Group for a 19 ½ square mile area about 1¼ miles to the west of Project Rulison. This decision was based on engineering and geological information regarding the very limited ability of natural gas to move through the Williams Fork Formation, which is the formation where the Project Rulison detonation occurred. This information showed that the Williams Fork formation consists of lenticular sandstones with limited areal extent which results in natural gas wells draining less than 40 acres. In February, 1995 the COGCC approved a request for 40 acre well density for the Williams Fork formation for a 52,000 acre area, and in January, 1998 the COGCC approved a request for 20 acre well density for the Williams Fork formation for two areas which totaled 4,300 acres. All of these areas are in the vicinity of Project Rulison, and both of these decisions were based on similar engineering and geologic information. **The information considered in these COGCC decisions also supports the conclusion that radionuclide contaminated gas from Project Rulison would not migrate laterally outside of the "Lot 11" quarter-quarter section of land containing the Project Rulison emplacement well.**

Radionuclides Remaining Underground at Project Rulison

The radionuclides produced by the type of nuclear device used at Project Rulison that could potentially appear as contaminants in natural gas are Tritium, Krypton-85, and Carbon-14, which are primarily beta radiation emitters. Only about 5 percent of the total Tritium produced from the detonation is contained in the gaseous phase, and it is estimated that about 40 percent would be trapped in the melted rock and about 55 percent in water. Most of the molten material and radioactive fission products collect in the bottom of the chimney in the form of glassy slag.[7]

To place the amount of radiation created by Project Rulison into perspective, If it were assumed that all of the gas from Project Rulison containing radionuclides were burned and mixed with the air above the ground within one mile of the well (a very conservative estimate), it could be calculated that the concentration of radioactivity in the air would be many times below the levels allowed by the federal government. If a person were to breathe this air continuously for one year, the total amount of radiation which he would receive would be less than 1/30th the amount they would receive from one chest x-ray, or less radiation than they would receive from flying from Las Vegas to New York in a jet airplane. It is also the same amount of radiation a skier spending two weeks or seven weekends at a mountain ski resort would be exposed to.[8]

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[7] "Current Status of Projects Gasbuggy, Rulison, and Rio Blanco and an Appraisal of Nuclear-Explosive Fracturing Potential for the Near Future" J.J. Stosur, July 1976

Using the values for subsurface pressure and temperature obtained at the beginning of the first production test, the gas in place in the chimney cavity and fracture zone was calculated to be 176 million cubic feet. During the entire three periods of production testing from October 1970 until April 1971, a total of 430 million cubic feet was produced from the Project Rulison R-EX re-entry well. The analysis of the gas samples taken during the production tests indicate that the hydrogen gas concentration declined linearly with cumulative production to approximately three percent of its initial concentration. Since all of the hydrogen gas contained in the produced gas (not associated with the hydrogen atoms in the natural gas molecular structure) was generated at the time of the nuclear explosion, the hydrogen concentration represents the relative remaining concentration of chimney cavity and fracture gas.[9]

This data shows that the underground concentration of the radioactive gas created by the detonation was greatly diluted down to approximately 3 percent of its original concentration by flushing nearly 2½ times the natural gas volume of the chimney cavity and fracture zone out of the re-entry well during the production tests in 1970 and 1971.

Radionuclide analysis of the gas produced and flared into the atmosphere from the re-entry well during the production tests in 1970 and 1971 also exhibited a great deal of reduction in the radionuclide concentrations in the gas during the production flow tests:[10]

Radionuclide	**Radionuclide Concentration in Produced Gas at Beginning of Production Tests October 1970 pCi/cc (Pico-Curie per Cubic Centimeter)**	**Radionuclide Concentration in Produced Gas at End of Production Tests April 1971 pCi/cc (Pico-Curie per Cubic Centimeter)**
Krypton-85	145	2.8
Tritium	185	3.3
Carbon-14	.35	.07

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[8] "Project Rulison and the Economic Potential of Nuclear Gas Stimulation", H.F. Coffer, G.W. Frank, and B.G. Bray

[9] "Report on Interpretation of Test Data from Project Rulison in the Rulison Field, Garfield County, Colorado", DeGolyer and McNaughton, December, 1971

[10] "Project Rulison Manager's Report", United States Atomic Energy Commission Nevada Operations Office, April 1973

Due to concern about the risk of radiation to workers during the drilling and completion of the Project Rulison re-entry well, extensive sampling and monitoring at the well site was performed. Bulk samples of recirculating drilling mud were analyzed regularly for gross gamma activity and the water fraction for Tritium. No mud was found contaminated during the initial drilling. Drilling chips were collected and were analyzed by gamma spectrometry. No chips were found that exceeded background activity during the initial re-entry drilling. During the completion of the re-entry well, no detectable activity was found in the mud or water displaced from the annulus between the production tubing and the casing. During the project, occupational radiation exposures were not measurably different from background. Project Rulison personnel urine assays for Tritium showed no positive results and there were no personnel radiation exposures as recorded by personnel radiation dosimeters. No air samples taken in work areas showed above background activity except for Tritium water vapor during flaring periods. The highest measured air concentration of Tritium at the Project Rulison site was 100,000 times less than the level established by the Atomic Energy Commission for occupational workers.[11]

The personnel risk information shows that there was an extremely low risk related to radiation exposure to workers at the well site and nearby residents **for a re-entry well drilled directly into the Project Rulison chimney cavity.** Radiation exposure risks for wells drilled outside of the "Lot 11" quarter-quarter section of land containing the Project Rulison emplacement well would be non-existent considering that the fracturing effects of the nuclear detonation were limited to less than a 300 foot radius from Project Rulison.

1997 Department of Energy Gas Analysis for Project Rulison Area Wells

In August, 1997 the Department of Energy took gas samples for radionuclide analysis from five Mesaverde gas wells with distances from Project Rulison varying from approximately 2¾ miles to approximately 7 miles in varying directions. The tests were performed in response to public concern about new planned gas well drilling activity within three miles of Project Rulison. The purpose of the tests was to determine if any natural gas containing radionuclides has migrated from Project Rulison to the producing gas wells. The tested gas wells were chosen to provide a sampling consisting of the gas wells nearest to Project Rulison, which are also the oldest producers in the area, and some more distant wells which have been recently completed using modern massive hydraulic fracturing techniques. The sampled gas wells have been producing for varying lengths of time, with the most prolific well being the Federal 28-95 located in the NW¼SE¼ Section 28, Township 7 South, Range 95 West which is approximately 2¾ miles west of Project Rulison. This well has produced approximately 412 million cubic feet of gas since it was drilled in 1962.

The gas samples were sent to Lawrence Livermore National Laboratory for radiation analysis. Originally, the lab was asked to check for Tritium, Carbon-14, and Krypton individually, but even as a combined figure the results for total activity were well below the lower limit of detection, confirming that there was no radioactivity in the gas from the producing wells.[12]

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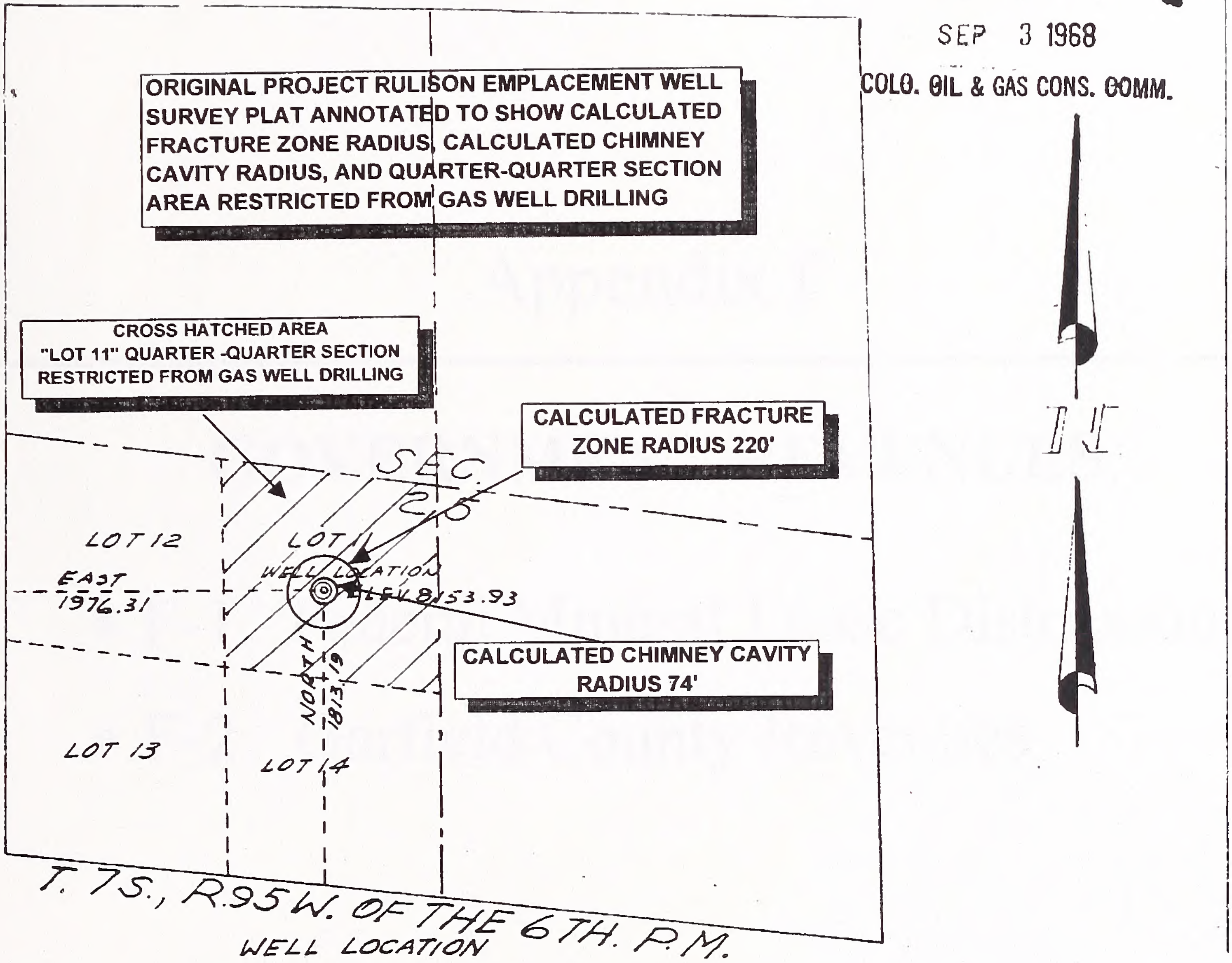
[11] "Project Rulison Manager's Report", United States Atomic Energy Commission Nevada Operations Office, April 1973

At the time of the gas analysis results, the COGCC committed to providing notification to the U.S. Department of Energy Nevada Operations Office whenever a natural gas well is permitted within a three mile radius of Project Rulison. The purpose of this notification is to provide the DOE the opportunity to take natural gas samples to monitor the wells for radiation activity.[12] As of May, 1998, two new natural gas wells have been permitted and drilled approximately 2¾ miles northeast of Project Rulison. The DOE was notified and plans to collect gas samples during May, 1998. If the sampling of any gas well were ever to detect the presence of any radionuclides, the well could be ordered shut in by the COGCC and the Bureau of Land Management (BLM) in their respective jurisdictions. For the reasons stated throughout this report, the likelihood of this occurring is extremely remote, however, the sampling program is a reasonable response to the public concern about Project Rulison.

RECEIVED
SEP 3 1968
COLO. OIL & GAS CONS. COMM.


ORIGINAL PROJECT RULISON EMPLACEMENT WELL SURVEY PLAT ANNOTATED TO SHOW CALCULATED FRACTURE ZONE RADIUS, CALCULATED CHIMNEY CAVITY RADIUS, AND QUARTER-QUARTER SECTION AREA RESTRICTED FROM GAS WELL DRILLING
CROSS HATCHED AREA "LOT 11" QUARTER -QUARTER SECTION RESTRICTED FROM GAS WELL DRILLING
CALCULATED FRACTURE ZONE RADIUS 220'
CALCULATED CHIMNEY CAVITY RADIUS 74'
SEC. 25
LOT 12
LOT 11
WELL LOCATION
ELEV. 8153.93
EAST 1976.31
NORTH 1813.19
LOT 13
LOT 14
N
T. 7S., R.95W. OF THE 6TH. P.M.

WELL LOCATION

HAYWARD A/25-95

AUSTRAL OIL COMPANY

HOUSTON, TEXAS

SITUATED IN LOT 11 SECTION 25

T. 7S., R 95 W. OF THE 6TH. P.M.

GARFIELD COUNTY, COLORADO

SCALE – 1 INCH = 1000 FEET

THIS IS TO CERTIFY THAT THE "WELL LOCATION" SHOWN ON THIS PLAT WAS PLOTTED FROM FIELD NOTES OF ACTUAL SURVEYS MADE BY ME OR UNDER MY SUPERVISION AND THAT THE SAME ARE TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF.

DATE SURVEYED SEPT. 8 1967

ROBERT D. SCARROW
REGISTERED LAND SURVEYOR
GLENWOOD SPRINGS, COLO.
CERTIFICATE NO. 3317

Appendix F

GOVERNMENT REVENUES

- F-1 Federal Mineral Lease Distribution
- F-2 Garfield County Revenues

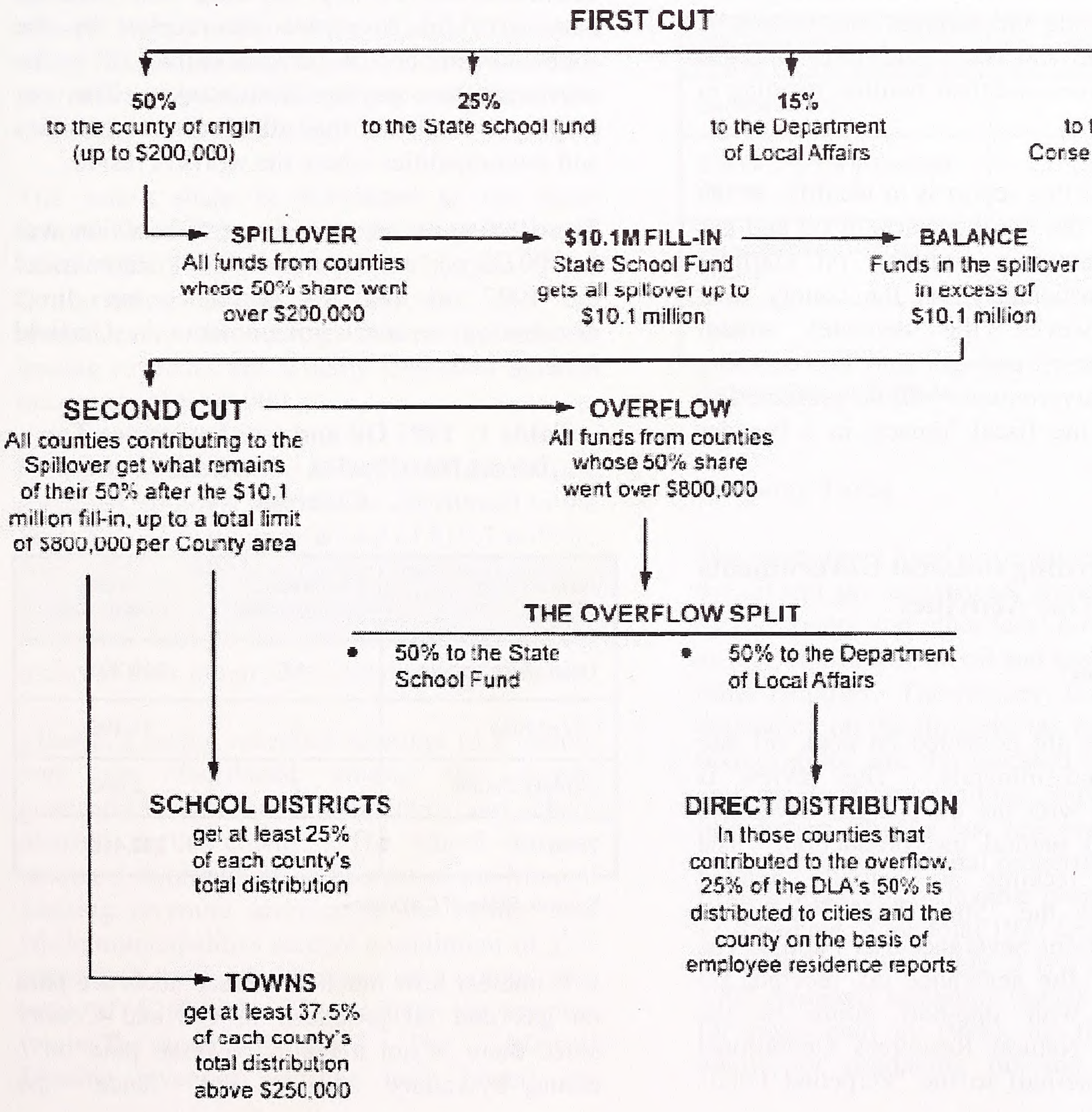
Federal Mineral Lease Distribution

Federal Mineral Leasing Act

- Net of administrative charges, returns. 50% of rents and royalties from Federal lands in the state of origin.
- Directs that funds be used by the states for planning, construction and maintenance of public facilities and services in areas of the state socially and economically impacted by mineral development.

Colorado Mineral Leasing Fund

- Colorado Statute (CRS 34-63-102) directs that distribution priority shall be given to school districts and political subdivisions socially or economically impacted by the development or processing of the federal minerals.
- Distributes the amounts originating in each county as reported by the Federal government under the following "cascade" formula.


FIRST CUT
50% to the county of origin (up to $200,000)
25% to the State school fund
15% to the Department of Local Affairs
10% to the Water Conservation Board
SPILLOVER All funds from counties whose 50% share went over $200,000
$10.1M FILL-IN State School Fund gets all spillover up to $10.1 million
BALANCE Funds in the spillover in excess of $10.1 million
SECOND CUT All counties contributing to the Spillover get what remains of their 50% after the $10.1 million fill-in, up to a total limit of $800,000 per County area
OVERFLOW All funds from counties whose 50% share went over $800,000
THE OVERFLOW SPLIT
50% to the State School Fund
50% to the Department of Local Affairs
SCHOOL DISTRICTS get at least 25% of each county's total distribution
DIRECT DISTRIBUTION In those counties that contributed to the overflow, 25% of the DLA's 50% is distributed to cities and the county on the basis of employee residence reports
TOWNS get at least 37.5% of each county's total distribution above $250,000

Overview
Natural Gas Revenues, Garfield County

Introduction

Natural gas production generates significant revenues for Garfield County and various local governments in the county. These revenues are derived from direct taxation such as property taxes, severance taxes, motor vehicle taxes and assessments. In addition, the industry pays federal mineral lease payments, vehicle fuel taxes, road permits and so on. The industry also impacts the local economy when making local purchases of goods and services and, indirectly, though purchases and taxes paid by oil and gas industry employees and their families residing in the county.

The objective of this report is to identify, to the extent possible, the fiscal impacts of oil and gas drilling and operation activities on Garfield County and, particularly, on the county road system. However, the revenues stream generated by the oil and gas activities accruing to other local governments will be presented to place some of the fiscal impacts in a broader context.

Revenues Accruing to Local Governments from Oil and Gas Activities

Severance Taxes

Severance taxes are collected on coal, oil and natural gas, and minerals. This review is concerned only with the oil and gas severance taxes levied on natural gas production. The severance tax receipts are initially divided equally between the "State Trust Fund" and "Local Government Severance Tax Fund". The state's share of the severance tax receipts are split in half with one-half going to the Department of Natural Resources Operational Account and one-half to the "Perpetual Fund" which, in turn, ends up in the Colorado Water Conservation Board loan program funds.

85 percent of the funds allocated to local governments are directed to local government grant projects. Fifteen percent of the local government share of severance taxes are distributed directly to local governments on the basis of the number of workers employed by a severance tax paying business. This distribution amounts to 7.5 percent of the severance tax receipts (one-half of fifteen percent).

The calculation of the local government direct distribution (7.5 percent of the total) is calculated merely by dividing the affected portion of the severance tax receipts by the statewide number of persons employed in the severance tax paying businesses. The per employee funds are then distributed to counties and municipalities where the workers reside.

The 1997 severance tax direct distribution was $1,400.23 per employee. Table 1 summarizes the 1997 oil and gas severance tax direct distribution to local governments in Garfield County.

Table 1. 1997 Oil and Gas Severance Tax Direct Distribution - Garfield County, Colorado

Jurisdiction	Number of Employees	Taxes Distributed
Town of Parachute	13	$18,203
City of Rifle	6	11,406
Garfield County	2	2,800
Total		**$32,410**

Source: State of Colorado

It is unclear how much severance taxes are paid on gas and oil produced in Garfield County since there is not a report of taxes paid on a county-by-county basis and since the information is considered private and not available to the general public. Furthermore, there is a tax credit applied to natural gas and oil severance taxes of 87.5 percent of property taxes paid. In most Colorado counties, the property tax credit completely offsets the severance tax obligation.

Mineral Leasing

Federal Mineral Leasing revenues are shared among federal, state and local governments. The Mineral Leasing revenues distribution formula is somewhat convoluted. To begin with, the federal government recovers its administrative costs and retains 50 percent of the mineral rentals and royalties which are the basis of the Mineral Leasing revenues. The remainder is disbursed by the federal government to the *Colorado Mineral Leasing Fund*.

The state's share is distributed to the *State School Fund* (25 percent), the Department of Local Affairs (15 percent), the Colorado Water Conservation Board (10 percent) and the remainder to the counties where the mineral leasing revenues are actually generated up to a maximum of $200,000.

Funds in excess of the $200,000 threshold (the so-called 'spillover funds'), are distributed to the *State School Fund* up to a total of $10.7 million. Any money remaining after the *State School Fund* has received its $10.7 million are redirected back to the counties that had already received their initial $200,000 threshold amount.

Mineral Leasing revenues accruing to a county area are distributed among the county government, and the municipalities and school districts in the county. The school districts receive a minimum of 25 percent of the Mineral Leasing revenues accruing to the county area while municipalities receive a minimum of 37.5 percent of the funds in excess of a county area total of $250,000. The county government retains the remaining funds. The Mineral Leasing revenues accruing to a county are deducted from the revenues derived by the county from the federal government's Payment in Lieu of Taxes (PILT) program. The maximum annual amount of Mineral Leasing monies that may be received by schools, municipalities and the county is $1.2 million.

The state's 1997 share of Mineral Leasing revenues generated in Garfield County was $2.2 million. Approximately $600,000 was eventually directly distributed to local governments within the county.

Table 2. 1997 Mineral Leasing Revenues Garfield County, Colorado

Jurisdiction	Mineral Leasing Revenues
Garfield County	$318,706
School Districts in Garfield County	149,971
Municipalities in Garfield County	131,206
Total	**$599,883**

Source: State of Colorado

Property Taxes

The most direct local government revenues from the oil and gas industry are property taxes levied by the county and other local governments such, as school districts, on oil and gas land, wells and other facilities. The property tax revenues vary depending on the property tax mill levy of each taxing entity and the assessed value of the oil and gas land and facilities within each taxing jurisdiction. In the last few years, oil and gas production and personal property have increased from 8.9 percent of taxable property in 1995 to 11.8 percent of the total 1997 taxable property in Garfield County. Table 3 is a summary of the 1997 Assessed Valuation (which forms the basis for taxes paid in 1998), for the county as a whole, of producing oil and gas land and facilities. Table 4 indicates the property tax revenues for each taxing entity in the county.

Oil and gas property taxes are based on 87.5 percent of the value of oil and gas produced in a given year. 1996 production is the basis for the 1997 assessed valuation which is used to determine the property taxes collected in 1998.

The Garfield County Assessor identified 740 producing wells in the 1997 County Abstract (wells reporting production in 1996). The Assessor's Office staff estimates that forty to fifty of those wells are producing gas owned by the federal government and not subject to local property taxation. There is also a wide variance in the amount of gas produced by the different wells. Wells that did not produce (or sell) gas are not included on the property tax rolls. (*Note:* There is a slight difference between the *Abstract* and the figures reported in Table 4. Table 4 is based on the Treasurer's tax roll.)

Table 3. Producing Oil and Gas Land, Improvements, and Personal Property Assessed Valuation - Garfield County, Colorado 1996 and 1997

Garfield County Total	1996	1997
Number of Wells	614	740
Producing Oil and Gas Land and Improvements	$28,543,470	$45,047,490
Producing Oil and Gas Personal Property	$6,684,680	$7,616,630
Total Producing Oil and Gas Assessed Valuation	$35,228,150	$52,664,120
Total Taxable Property Assessed Valuation	$362,900,830	$444,129,050
Producing Oil and Gas as a % of all Taxable	9.7%	11.9%

Source: Garfield County Abstracts of Assessments 1996 and 1997

Table 4. Producing Oil and Gas Land and Facilities - Assessed Valuation, Mill Levies and Property Tax Revenues - Garfield County, Colorado and Select Tax Jurisdictions within Garfield County

Tax Jurisdiction	1997 Oil & Gas Assessed Valuation	1997 Mill Levy	1998 Property Taxes from Oil and Gas
Garfield County	$52,406,850	13.655	$715,616
RE-2 School District	23,927,350	34.272	820,038
School District-16 (Parachute)	19,788,710	19.836	392,529
(DeBeque) School District-49JT	8,690,790	39.648	344,572
Grand Valley Fire District	20,074,440	3.755	75,380

Tax Jurisdiction	1997 Oil & Gas Assessed Valuation	1997 Mill Levy	1998 Property Taxes from Oil and Gas
Burning Mountain Fire District	2,922,920	0.284	9,491
Rifle Fire District	20,718,700	6.881	142,565
Bluestone Water	29,037,570	0.161	4,675
Colorado River Water Conservancy	52,406,850	0.307	16,090
Silt Water Conservation District	802,670	1.306	1,048
West Divide Water	17,927,740	0.284	5,091
Colorado Mountain College	43,716,060	3.944	172,416
Grand River Hospital District	52,406,850	5.597	293,621
Grand Valley Cemetery District	19,788,710	0.249	4,927
Parachute/Battlement Mesa Recreation District	4,076,370	3.646	14,862
TOTAL			**$3,012,622**

Source: Derived from Garfield County Records

Garfield County will collect 23.8 percent of the oil and gas property taxes paid to all local governments in the county in 1998. Garfield County property tax revenues are allocated to seven funds on the basis of mill levies assigned to each fund by the Board of County Commissioners. Table 5 is a summary of the Garfield County mill levies and property taxes from oil and gas production. As noted above, the revenues derived from oil and gas production account for approximately 11.8 percent of the property tax revenues allocated to each of the Garfield County budget funds.

Table 5. Garfield County 1998 Property Taxes from Oil and Gas Production Assessed Valuation of $52,406,850

Fund	1997 Mill Levy	1998 Property Taxes from Oil and Gas Production
General	8.677	$454,734
Road and Bridge	1.409	73,841
Social Services	1.234	64,670
Retirement	0.308	16,141
Capital Expenditures	1.579	82,750
Primary Oil & Gas Exemption	0.315	16,508
Airport	0.133	6,970
Total	**13.655**	**$715,616**

Assuming that Garfield County will receive approximately the same amount of Mineral Leasing (or increased PILT revenues) and Severance Tax revenues in 1998 as in 1997, oil and gas production activities will generate slightly over $1 million in Garfield County revenues. Table 6 is a summary of the tax receipts. Additional revenues are also received for motor vehicle and equipment registrations although anecdotal evidence suggests that the county does not collect all of those revenues due to both deliberate and unintentional non-registration. The same applies to County Road Permits.

Table 6. Summary of Garfield County Tax Receipts from Oil and Gas Production

Tax/Revenue Source	Revenues
1998 Property Taxes (1997 Valuation)	$715,616
1997 Mineral Leasing	318,706
1997 Severance Tax	2,800
Total	**$1,037,122**

Garfield County Road and Bridge Budget

The impacts as well as demands for service created by the oil and gas industry are most keenly felt by the Garfield County Road and Bridge Department. [This is a reasonable assumption considering the taxing entities identified above which receive significant revenues from oil and gas production but which provide little, if any, direct services to the industry.] Oil and gas drilling and operation equipment traveling on county roads is considered by the Road and Bridge Department to be a significant and growing cause road damage. The Road and Bridge Department is responsible for maintaining several hundred miles of road of which only a portion is regularly used by the oil and gas industry. Nevertheless, the Road and Bridge Department perceives that the damage caused by oil and gas rigs is very disproportionate to the road miles used by the industry.

The Road and Bridge Department has indicated that it does not have the financial resources to repair or reconstruct county roads destroyed by oil and gas related traffic. The following subsections present a synopsis of the Road and Bridge budget identifying revenues and major expenditure categories.

Road and Bridge Fund Revenues

The 1998 budgeted revenues for the Garfield County Road and Bridge Fund are $5 million. The single largest revenue source is the Highway Users Tax Fund (HUTF) which is a state fuel tax distributed to each county on the basis of a formula including variables for the number of motor vehicles registered in a county, county road miles *et cetera*. HUTF funds are budgeted to provide about 44 percent of the Road and Bridge Fund revenues in 1998. The 1998 HUTF Garfield County revenues are projected to be $2.2 million.

Revenues from federal government sources are projected to provide fifteen percent of the Road and Bridge Fund 1998 revenues. The County Commissioners allocate all of the PILT moneys to the Road and Bridge Fund as well as payments for Forest Service programs. 1997 federal revenues allocated to the Road and Bridge Fund totaled $992,000. $775,000 is budgeted for 1998.

Local revenues constitute approximately 41 percent of the Road and Bridge Fund 1998 revenues. The largest local revenue categories are Property Taxes, which will generate approximately $626,000 in 1998, and Sales Taxes which are expected to amount to about $1.1 million in 1998. The Sales Tax was approved by the voters in 1996 and first collected in 1997. Property taxes from oil and gas production are about 11.8 percent of the

Road and Bridge property tax revenues as noted above, and 1.5 percent of all Road and Bridge Fund revenues.

The county also levies a property tax for the *Primary Oil and Gas Exemption Fund*. This is a mill levy on all property in the county. The County Commissioners are transferring all of the funds from the Oil and Gas Fund to the Road and Bridge Fund in 1998 for use on roads impacted by the oil and gas industry.

Table 7. Garfield County Road and Bridge Budget Summary 1996 - 1998

REVENUES

Revenue Source	1996	1997	1998 Budget
Federal Funds			
Payments in Lieu of Taxes (PILT)	$345,787	$526,678	$500,000
Forest Service L & M	1,192	465,381	275,000
State Funds			
Highway Users Tax Fund (HUTF)	$2,176,591	$1,980,194	$2,197,000
Local Revenues			
Property Taxes	$519,691	$579,692	$625,658
Sales Taxes	0	921,213	1,114,000
Specific Ownership Taxes	71,068	81,052	64,000
Motor Vehicle Special Assessments	87,767	85,183	64,000
Transfer from the Oil & Gas Fund	74,175	54,624	149,562
All Other, less Fees & Tax Rebates	125,899	120,831	(830)
Total Revenues	**$3,402,164**	**$4,814,846**	**$4,996,390**

EXPENDITURES

Expenditure Category	1996	1997	1998 Budget
Administration	$ 372,803	$ 389,795	$ 408,980
Construction	413,889	1,520,644	3,185,241
Maintenance	1,603,009	1,565,530	2,687,665
Snow Removal	237,314	312,789	240,385

EXPENDITURES			
Expenditure Category	**1996**	**1997**	**1998 Budget**
Total Expenditures	**$2,627,015**	**$3,788,757**	**$6,522,271**
Net Fiscal Balance (Revenues less Expenditures)	**$775,149**	**$1,026,089**	**($1,525,881)**
Uncommitted Fund Balance	$4,002,470	$5,015,794	$3,489,913 (calculated from budget)

Source: Garfield County Accounting Office and 1998 Budget

Road and Bridge Fund Expenditures

The county groups Road and Bridge expenditures into four general categories as indicated in Table 7. The largest expenditure categories are Construction and Maintenance The distinction between maintenance and construction is often blurry in the road and bridge business. Construction activities typically consist of reconstructing portions of existing roads, for example, roads damaged by overweight vehicles.

The 1998 budget identifies only one specific construction project - the reconstruction of County Road 109 near Carbondale. The County Road 109 project is budgeted to cost $1.8 million. The County has been saving money for this project for several years and will fund it substantially out of Road and Bridge cash reserves.

The Net Fiscal Balance calculated in Table 7 is merely the difference between revenues and expenditures. Changes in cash reserves are reflected in the Uncommitted Fund Balance. The Uncommitted Fund Balance is the cash in the Road and Bridge Fund less bills to be paid from the Fund. The 1998 calculated Uncommitted Fund Balance is included in Table 7.

Appendix G

FISH AND WILDLIFE CONSULTATION

APPENDIX G: FISH AND WILDLIFE SERVICE CONSULTATION

MARCH 3, 1849

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Glenwood Springs Resource Area
50629 Highway 6 and 24
P.O. Box 1009
Glenwood Springs, Colorado 81602

IN REPLY REFER TO:

January 22, 1998

To: Acting Assistant Field Supervisor, USF&WS

From: Area Manager, Glenwood Springs Resource Area

Subject: Oil and Gas Supplemental EIS

The Glenwood Springs Resource Area (GSRA) is currently developing a supplemental Environmental Impact Statement (EIS) on oil and gas development in the GSRA. BLM originally completed the Colorado Oil and Gas Leasing and Development EIS (COGEIS) in 1991. Since then, it has become apparent that actual development in the GSRA will exceed the level evaluated in that document in the near future. The supplemental document will modify the original EIS by describing the impacts of the higher level of development we are currently experiences and anticipate to continue into the future.

The supplemental EIS will include the entire GSRA, but will focus on the area known as Region 4 (see map). Additionally, the EIS will include the developed portion of the Naval Oil Shale Reserve (NOSR) that was mandated by Congress to be leased within one year of the signing of Public Law 105-85 (November 18, 1997).

In order to ensure that we adequately assess impacts to Threatened and Endangered species in the EIS, we are requesting a species list for those listed and candidate species likely to be found in the GSRA, particularly those in Region 4, which includes the NOSR.

We plan to address impacts to T&E species in a similar manner as the COGEIS, in which formal consultation was deferred to the Plan of Development (POD) or Application for Permit to Drill (APD) stage with the exception of the endangered Colorado River fishes. As we develop our scenario for the number of wells anticipated to be drilled over the life of the EIS, we sill determine the average annual depletion volume and initiate the appropriate consultation with your office at that time.

Thank you for your assistance in this matter. If you have any questions, please contact Sue Moyer of our Grand Junction office at (970) 244-3074.

Stephen R Moore
for Michael Mottice
Area Manager

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Glenwood Springs Resource Area
50629 Highway 6 and 24
P.O. Box 1009
Glenwood Springs, Colorado 81602

IN REPLY REFER TO:

April 21, 1998

To: Acting Assistant Field Supervisor, USF&WS

From: Area Manager, Glenwood Springs Resource Area

Subject: Oil and Gas Supplemental EIS

As stated in our memo of January 22, 1998, the Glenwood Springs Resource Area (GSRA) is developing a supplemental Environmental Impact Statement (EIS) on oil and gas development in the Resource Area. Our previous EIS, the Colorado Oil and Gas Leasing and Development EIS (COGEIS) was completed in 1991 and was anticipated to have a life of approximately 20 years. However, development in the GSRA has already reached the number of wells analyzed in that document. The supplemental EIS will modify the original EIS by describing the impacts of the higher level of development that we are currently experiencing and that we anticipate to continue into the future.

We have recently developed a scenario detailing the number of wells that could be drilled on Federal minerals over the twenty-year timeframe analyzed in the supplemental EIS. An average of 15 wells per year on Federal mineral estate results in three hundred wells over 20 years . Obviously some years we will permit more than 15 wells and in others, less. The 15 well figure was derived from the average number of wells drilled over the last 5 years, a period of increased production in the GSRA, projected into the future.

In order to get an accurate picture of water depletion associated with drilling and completing wells in Region 4 (the area within GSRA that has the highest potential of oil and gas activity - see the attached map), we contacted two of the most active companies in this area (Barrett Resources Corporation and Tom Brown Inc.) and asked for figures on water usage. Both companies reported using approximately 20,000 barrels of water to drill and complete a gas well in this area. This number corresponds to 2.58 acre feet per well.

If you multiply the average figure of 2.58 acre feet per well times the annual average number of wells expected over the next 20 years (15), the resulting figure of 38.7 acre feet would be the average annual depletion amount.

The US Fish and Wildlife Service has determined that any federal actions which result in a water depletion, automatically require a "may affect" determination on the Razorback sucker, Colorado squawfish, Humpback chub and Bonytail. We are therefore requesting formal consultation on the water depletion aspects of the ongoing development of Federal oil and gas resources in Region 4 of the GSRA on the endangered fish and critical habitat.

Lessees will be informed of potential conflicts with listed and candidate species. BLM will consult on a well-by-well basis on any terrestrial species that may be affected and on any physical disturbance of critical habitat.

BLM will provide an annual account of the number of wells drilled and acre feet of water depleted by oil and gas development in the GSRA.

If you have any questions, please call Sue Moyer of our Grand Junction office at (970) 244-3074.

Michael S. Mottice
Area Manager

MARCH 3, 1849

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
Western Colorado Office
764 Horizon Drive, South Annex A
Grand Junction, Colorado 81506-3946

IN REPLY REFER TO:
ES/CO:BLM
MS 65412 GJ

February 23, 1998

Memorandum

To: Area Manager, Bureau of Land Management, Glenwood Springs Resource Area, Glenwood Springs, Colorado

From: Acting Assistant Field Supervisor, Fish and Wildlife Service, Ecological Services, Grand Junction, Colorado

Subject: Threatened, Endangered, and Candidate Species List

This is in response to your January 22, 1998, correspondence requesting a list of threatened, endangered and candidate Species that could occur within the Glenwood Springs Resource Area. To comply with section 7(c) of the Endangered Species Act of 1973, as amended, Federal agencies or their designees are required to obtain from the Service information concerning any species or critical habitat, listed or proposed to be listed, which may be present in the area of a proposed construction project. Therefore, we are furnishing you the following list of species which may be present in the concerned area:

FEDERALLY LISTED SPECIES

Black-footed ferret	*Mustela nigripes*
Peregrine falcon	*Falco peregrinus*
Bald eagle	*Haliaeetus leucocephalus*
Whooping crane	*Grus americana*
Mexican spotted owl	*Strix occidentalis lucida*
Southwestern willow flycatcher	*Empidonax traillii extimus*
Razorback sucker	*Xyrauchen texanus*
Colorado squawfish	*Ptychocheilus lucius*
Humpback chub	*Gila cypha*
Bonytail	*Gila elegans*
Sclerocactus glaucus	Uinta Basin hookless cactus

We would like to bring to your attention species which are candidates for official listing as threatened or endangered species (Federal Register, Vol. 62, No. 182, September 19, 1997). While these species presently have no legal protection under the Endangered Species Act, it is within the spirit of the Act to consider project impacts to potentially sensitive candidate species. Additionally, we wish to make you aware of the presence of Federal candidates should any be proposed or listed prior to the time that all Federal actions related to the project are completed.

FEDERAL CANDIDATE SPECIES

Boreal toad	*Bufo boreas boreas*
Penstemon debilis	Parachute penstemon

If the Service can be of further assistance, please contact Kurt Broderdorp at the letterhead address or (970) 243-2778.

cc: CDOW, Grand Junction
FWS/ES, Lakewood

KBroderdorp:BLMGS.SL:022398

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
Western Colorado Office
764 Horizon Drive, South Annex A
Grand Junction, Colorado 81506-3946

IN REPLY REFER TO:

ES-6-RO-95-F-001-GJ209
MS 65412 GJ

May 21, 1998

Memorandum

To: Area Manager, Glenwood Springs Resource Area, Bureau of Reclamation, Glenwood Springs, Colorado

From: Acting Assistant Field Supervisor, Fish and Wildlife Service, Ecological Services, Grand Junction, Colorado

Subject: Oil and Gas Supplemental EIS

In accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.), and the Interagency Cooperation Regulations (50 CFR 402), the Fish and Wildlife Service reviewed your April 21, 1998, correspondence regarding the impacts of the Oil and Gas Supplemental EIS on endangered Colorado River fishes. The projects are located within the Bureau of Land Management's Glenwood Springs Resource Area, in Garfield, Eagle, Pitkin, Routt and Mesa Counties, of Colorado. The proposed action will cause an average annual depletion of 38.7 acre-feet to various locations within the Glenwood Resource Area of the Colorado River Basin. An annual report on depletions should be submitted to the Service for the duration of the Supplemental EIS.

A Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin was initiated on January 22, 1988. The Recovery Program was intended to be the reasonable and prudent alternative to avoid jeopardy to the endangered fishes by depletions from the Upper Colorado River Basin.

In order to further define and clarify the process in the Recovery Program, a section 7 agreement was implemented on October 15, 1993, by the Recovery Program participants. Incorporated into this agreement is a Recovery Implementation Program Recovery Action Plan which identifies actions currently believed to be required to recover the endangered fishes in the most expeditious manner.

Included in the Recovery Program was the requirement that a depletion fee would be paid to help support the Recovery Program. On March 5, 1995, the Service issued an intra-Service biological opinion determining that the depletion fee for depletions of 100 acre-feet or less are no longer required because the Recovery Program has made sufficient progress to be the reasonable and prudent alternative to avoid the likelihood of jeopardy to the endangered fishes and to avoid destruction or adverse modification of their critical habitat by depletions of 100 acre-feet or less. Therefore, the depletion fee for this project is waived.

cc: CDOW, Grand Junction
FWS/ES, Lakewood

KBroderdorp:BLM209.BO:052198

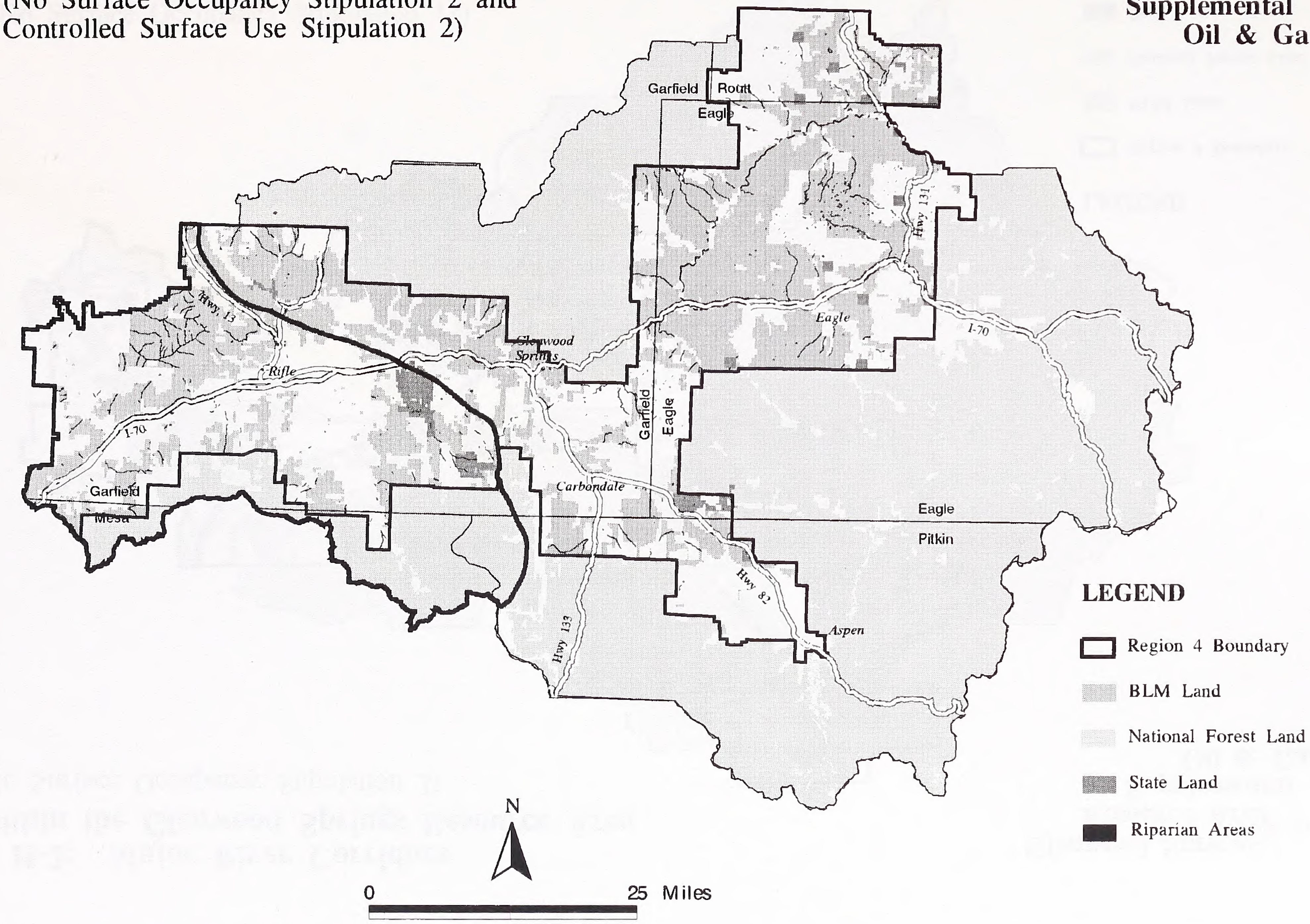
Appendix H

GSRA MAPS

Map H-1: Riparian Areas within the Glenwood Springs Resource Area

(No Surface Occupancy Stipulation 2 and Controlled Surface Use Stipulation 2)

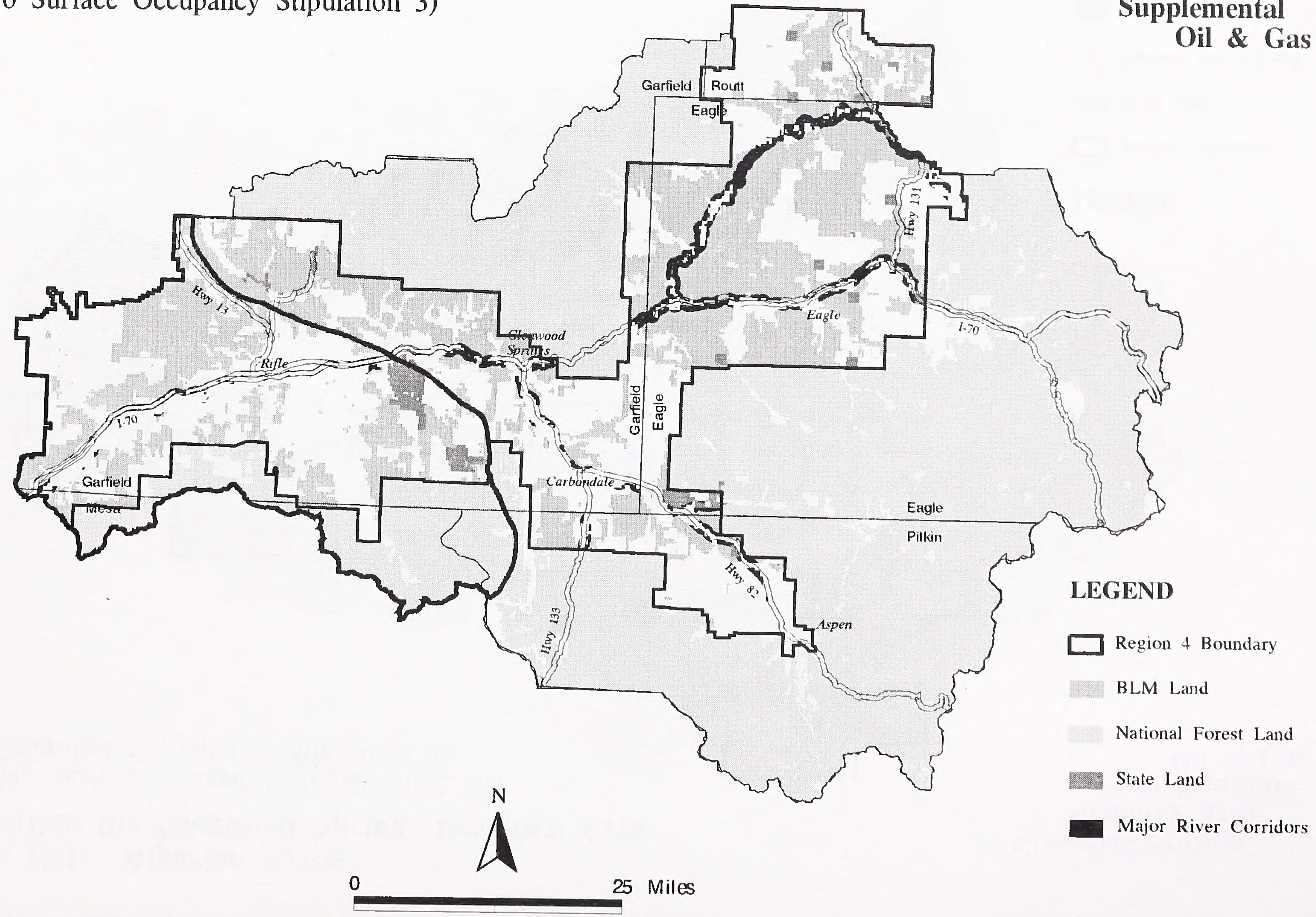
Glenwood Springs
Resource Area
Supplemental
Oil & Gas EIS



Map H-2: Major River Corridors within the Glenwood Springs Resource Area

(No Surface Occupancy Stipulation 3)

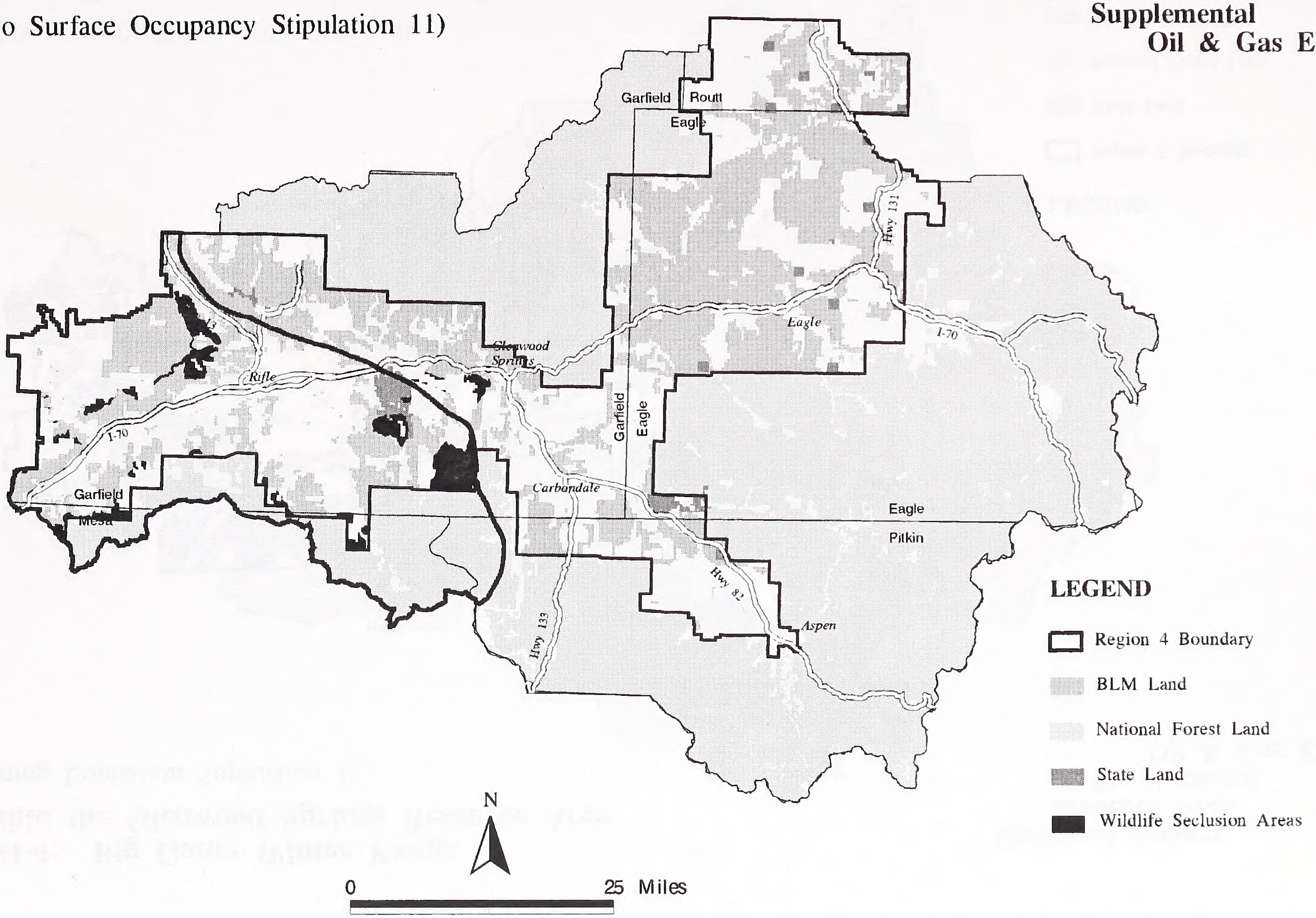
Glenwood Springs
Resource Area
Supplemental
Oil & Gas EIS



Map H-3: Wildlife Seclusion Areas within the Glenwood Springs Resource Area

(No Surface Occupancy Stipulation 11)

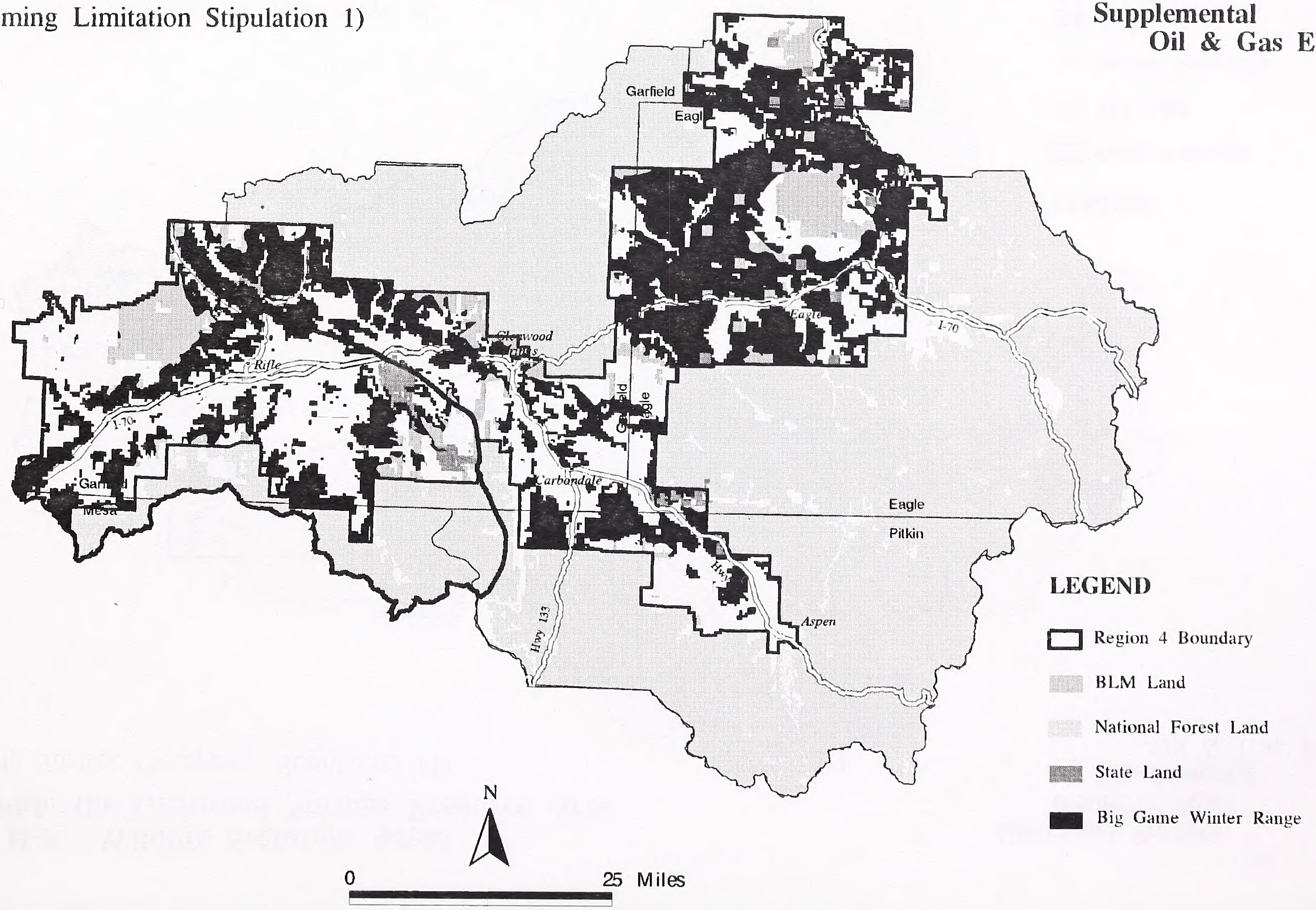
Glenwood Springs
Resource Area
Supplemental
Oil & Gas EIS



Map H-4: Big Game Winter Range within the Glenwood Springs Resource Area

(Timing Limitation Stipulation 1)

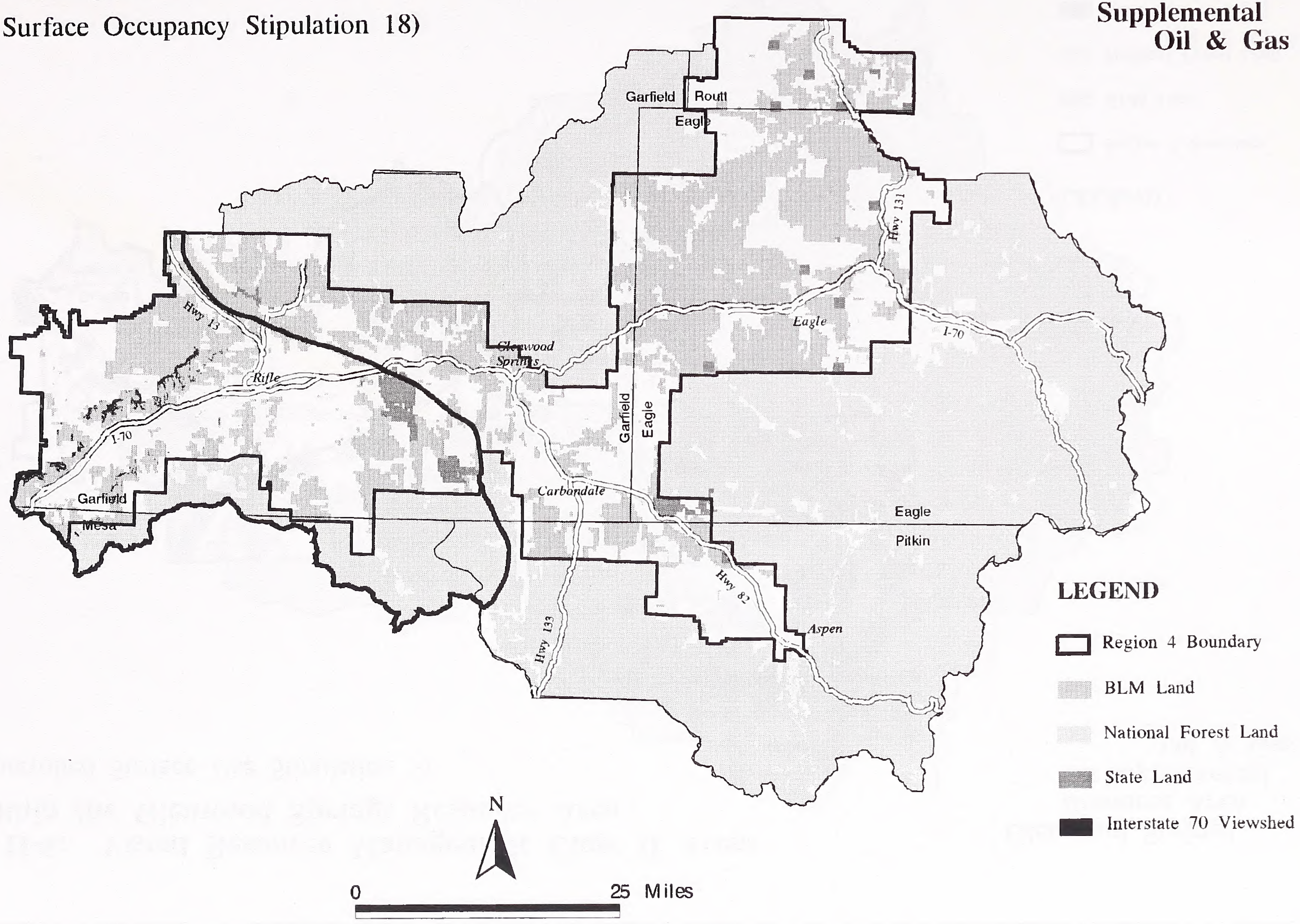
Glenwood Springs
Resource Area
Supplemental
Oil & Gas EIS



Map H-5: Interstate 70 Viewshed within Region 4

(No Surface Occupancy Stipulation 18)

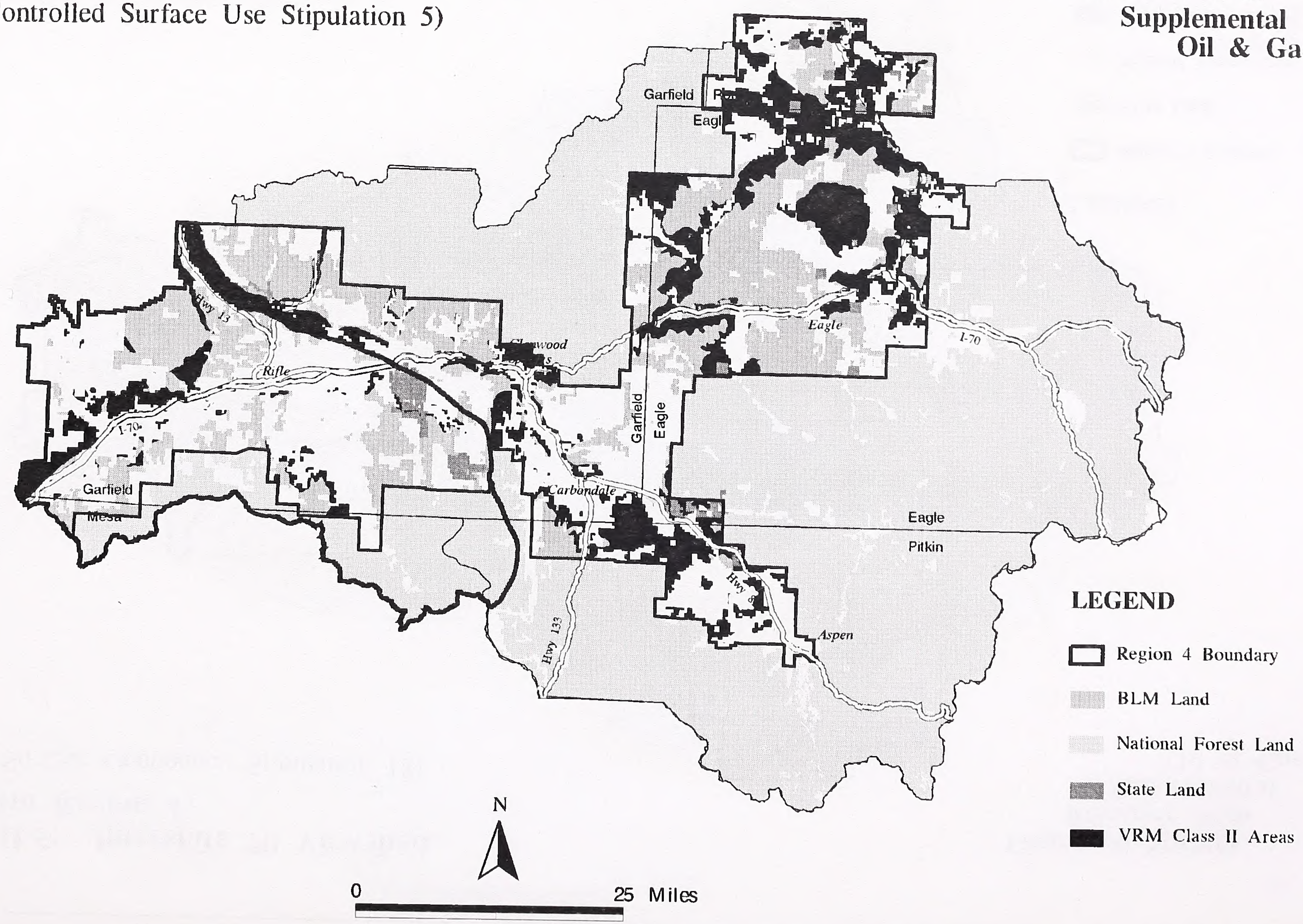
Glenwood Springs
Resource Area
Supplemental
Oil & Gas EIS



Map H-6: Visual Resource Management Class II Areas within the Glenwood Springs Resource Area

(Controlled Surface Use Stipulation 5)

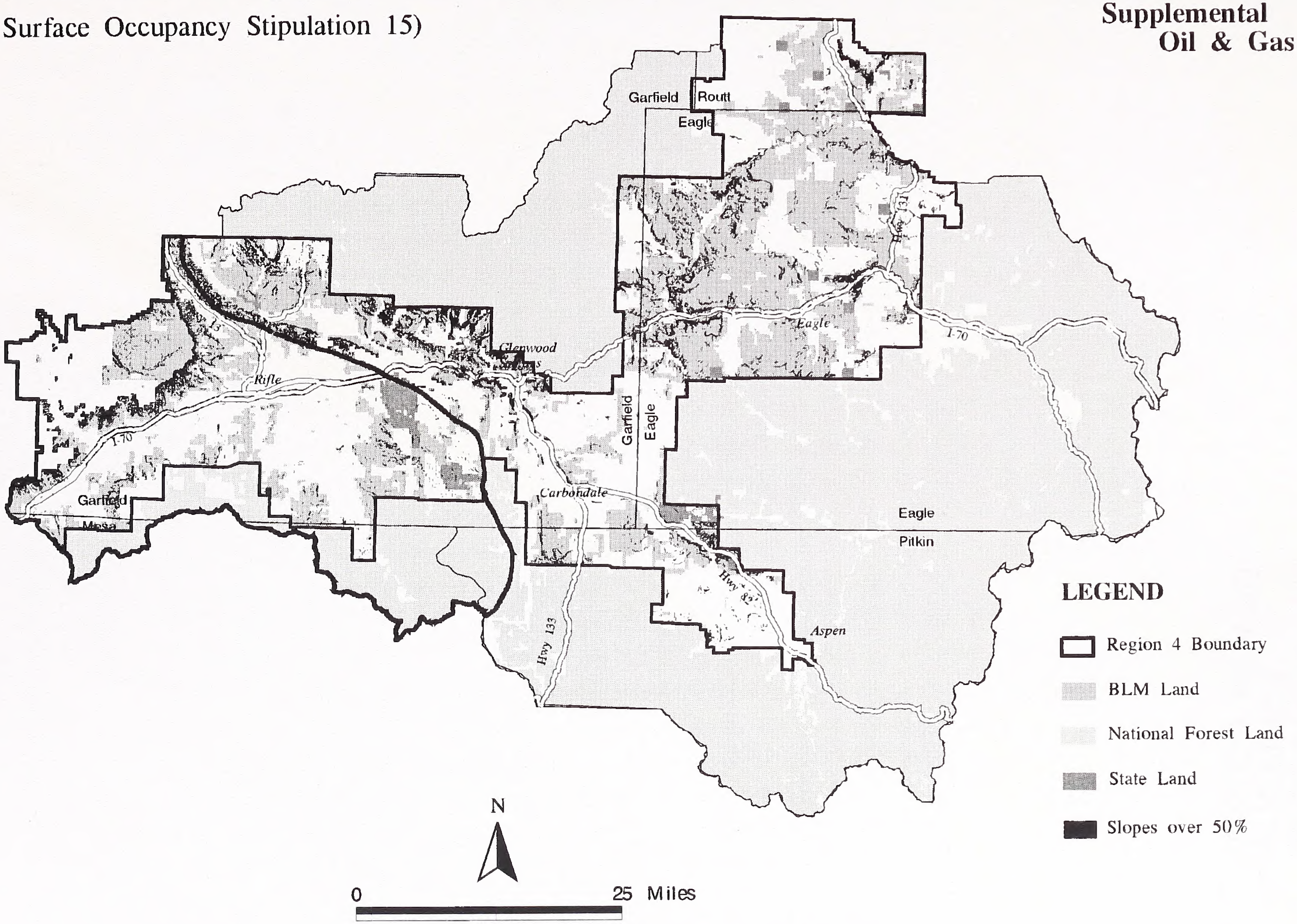
Glenwood Springs
Resource Area
Supplemental
Oil & Gas EIS



Map H-7: Slopes Over 50% within the Glenwood Springs Resource Area

(No Surface Occupancy Stipulation 15)

Glenwood Springs
Resource Area
Supplemental
Oil & Gas EIS



LEGEND

- ☐ Region 4 Boundary
- ▨ BLM Land
- ░ National Forest Land
- ▩ State Land
- ■ Slopes over 50%

BLM LIBRARY
BLDG 50, ST-150A
DENVER FEDERAL CENTER
P.O. BOX 25047
DENVER, COLORADO 80225